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ARMED FORCES CHEMICAL JOURNAL

OFFICIAL PUBLICATION OF THE ARMED FORCES CHEMICAL ASSOCIATION

SUITE 819, 2025 EYE STREET, N.W., WASHINGTON 6, D.C.

VOLUME X SEPTEMBER-OCTOBER 1956 NO. 5

COVER PHOTO

The new United States Army flag designed by heraldic experts in Office of Quartermaster General officially presented to Army Secretary Brucker by Vice President Nixon at Flag Day ceremonies held at The Capitol June 13. See description on page 9.

The fact that an article appears in this magazine does not indicate approval of the views expressed in it by any one other than the author. It is our policy to print articles on subjects of interest in order to stimulate thought and promote discussion; this regardless of the fact that some or all of the opinions advanced may be at variance with those held by the Armed Forces Chemical Association, National Officers, and the Editors. It is the responsibility of contributors, including advertisers, to obtain security clearance, as appropriate, of matter submitted for publication.

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Published bi-monthly—Jan.-Feb.; Mar.-Apr.; May-June; July-Aug.; Sept.-Oct.; Nov.-Dec.—by the Armed Forces Chemical Association, National Headquarters, located at Suite 819, 2025 Eye St., N.W., Washington 6, D.C. Entered as second class matter at the Post Office at Washington, D.C., under the Act of March 3, 1879. Additional entry at Nashville, Tenn. Subscription price $3.00 per year to members; $6.00 per year to non-members in the United States, Canada and Mexico; elsewhere $1.00 additional for postage. Inquiries concerning circulation and advertising should be addressed to the Secretary-Treasurer.

PRESIDENT HUTT'S MESSAGE TO A. F. C. A. MEMBERSHIP

Many of you (over 750) who attended the 11th ANNUAL MEETING of the ARMED FORCES CHEMICAL ASSOCIATION in Boston (June 14 and 15) know it was an outstanding success. Those who did not attend have probably read the excellent reports, with pictures, of this meeting in the July-August issue of the AFCA JOURNAL.

The New England Chapter is to be congratulated on organizing and "staging" such a successful event. Much hard work and planning is involved in making an annual meeting successful.

What has impressed me is the intense interest and enthusiasm that was generated at this meeting. If this could be maintained throughout the year and passed along to each chapter, AFCA would "go places and do things." Let's not let this spark die down or be extinguished . . . let's keep it ever growing and growing.

There is a great and broad field of activity for our association in helping to form a partnership between the chemical industry and the Armed Forces. The objectives in our constitution (as covered in Article II) describe fully and clearly our role in this work.

Let me emphasize once more . . . keep the spark that was lit at the 11th annual meeting in Boston, growing and increasing in intensity to weld a partnership between CHEMICAL INDUSTRY and the ARMED FORCES.

Glenn A. Hutt
President

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ARMED FORCES CHEMICAL ASSOCIATION ACTIVITIES

★ ★ ★

ADMIRAL PRIME'S MESSAGE TO 11TH ANNUAL MEETING

While Immediate Past President Prime had hoped, until almost the last moment for leaving, that he would be able to attend the 11th annual meeting of A.F.C.A., June 14-15, in Boston, he nevertheless made provision for a written message to the membership in the event — as it so happened — health considerations prevented his going.

In a letter to the President of New England Chapter, Admiral Prime stated forcefully his views on the importance of the Chemical Corps and the Association with respect to the National Defense. His letter was printed in the souvenir program for the annual banquet but is reproduced here for the benefit of those who have not had opportunity to read it:

"President
New England Chapter, AFCA
Boston, Massachusetts
Attention: Mr. Harry A. Wansker,
Chairman Annual Meeting Committee

"My dear President:

"If you will bear with me a moment, I would like to express to you in a few words some of the concepts which I have held and still hold concerning the role which this Association plays as a liaison group between the United States, Army Chemical Corps and the Chemical Industry of the United States.

"Whether this country be at peace, in a state of cold war, or in a state of declared war, it is self-evident that the chemical industry represents one of the main and key foundation stones in the structure of our National Defense. Without this industry, we could not successfully prosecute any armed conflict. Within the official structure of the National Defense, we find, under the Department of the Army, an organization originally known as the 'Chemical Warfare Service' and for these past several years named the 'Chemical Corps'. Among other things, the mission of the Chemical Corps includes the offense and defense functions of the Armed Forces as they relate to chemical weapons. In recent years, this has expanded to include biological and radiological weapons. I believe with all my heart that the present structure of the Army including a Chemical Corps as such is the best possible method of maintaining adequate and sufficient defense and offense knowledge with respect to chemical and biological weapons.

"Since no weapon can be produced without a manufacturer and since the manufacturer of chemical weapons is in a specialized field not available to all types of manufacturers, it follows that a chemical industry is needed to provide chemical weapons. In defense, the same is basically true; a manufacturer of chemical-type defensive weapons must necessarily be part of the chemical industry.

"Our traditions maintain themselves. Among these is that of dependence upon private capital and private labor organized as a free enterprise to provide manufactured goods for the defense of the country.

"This Association, composed of men who have been in the chemical side of war, and many of whom have been, are, and will be, directly associated in time of war with the Chemical Corps, together with men who are a part of the chemical industry, provides, through its membership, the strongest possible liaison between the official and the business chemical defense forces of our country. With this Association, preparedness for chemical war maintains itself in current status throughout peacetime. I believe that should this Association perish, the defense of the country would be seriously, if not fatally affected.

"I cannot urge too strongly my belief in the foregoing statements. I believe that we all as Americans who are interested in chemistry and who are devoted to our country believe likewise.

Very sincerely yours,

s/ NATHANIEL S. PRIME
Rear Admiral, U. S. Navy (Ret.)
President"

NAVY RELIEF SOCIETY EXPRESSES GRATITUDE FOR $1,000 DONATION

The Navy Relief Society in a letter to Mr. Harry A. Wansker has expressed its appreciation and thanks for the donation of $1,000 presented to the Society by New England Chapter at the banquet at Hotel Somerset in Boston on June 15, concluding the 11th annual meeting of A.F.C.A., for which the U. S. Navy was the "host service".

Following is the Society's letter to Mr. Wansker, vice-president of A.F.C.A., now President of New England Chapter, who was General Chairman of the 11th annual meeting:

"Navy Relief Society
Washington, D. C.
18 July 1956

"Dear Mr. Wansker:

"Admiral Snackenberg, Commandant of the First Naval District, has forwarded to us the check for $1000 representing a contribution to the Navy Relief Society from the New England Chapter, Armed Forces Chemical Association. In his letter of transmittal he noted that you were Chairman of the Annual Meeting at which the presentation was made.

"On behalf of the Board of Managers of the Society and, particularly our Naval and Marine families everywhere whom the Society serves, it is a pleasure to extend to you and through you to the members of your fine Association, our most grateful appreciation for your kind and generous contribution to our work. This thoughtful remembrance will be of real help in our continuing efforts to assist our people in times of need.

"It is especially gratifying to know that an organization which is contributing so much to physical and scientific development is not unmindful of the human and social problems that are inherent in our material progress.

"Will you please extend to your members our sincere thanks for their very generous support and interest both in the Navy Relief Society and those it serves.

Sincerely yours,
s/ V. R. MURPHY
Vice Admiral, USN (Ret.)
Executive Vice President

Mr. Harry A. Wansker
United-Carr Fastener Corporation
Cambridge 42, Massachusetts"

Mr. Wansker, in a letter of reply to Admiral Murphy, dated July 30, stated as follows:

"Thank you so much for your letter of 18 July expressing the appreciation of the Navy Relief Society on receiving a check for $1000 from the New England Chapter of the Armed Forces Chemical Association as forwarded to you by Admiral Snackenberg, commandant of the First Naval District.

"Needless to say, we are very happy to have the Navy Relief Society receive this check. It is only a small token of our appreciation for what the Navy did for us as host on 15 June 1956. Practically two years of cooperative effort went into the program to make it eventually the success that it was. If we have stimulated the fathers, mothers and teenagers to the proper thinking of what the Navy means to them, then truly our task was accomplished.

"I am sending a copy of this letter to the headquarters Association in Washington along with your letter of 18 July believing they may wish to insert it in the Armed Forces Chemical Journal as soon as proper space becomes available."

NEW ENGLAND CHAPTER

At the recent annual meeting the following officers and directors were elected for the current fiscal year: President, Mr. Harry A. Wansker; Vice President, Mr. James Donovan; Treasurer, Col. Chenery Salmon; and Secretary, Mr. John H. Adams. Directors: Messrs. T. D. Adams, Matthew M. Berman, Arthur G. Boardman, A. A. Borland, Edward J. Bushell, John J. McDonald, William Tracy, Earl Watson, Charles B. Weeks and Dr. Harold C. Weber.

MR. WANSKER HONORED

A Certificate of Achievement with citation by Maj. Gen. William M. Creasy, Chief Chemical Officer of the Army, was presented to Mr. Harry A. Wansker, Vice President of A.F.C.A., and President of the New England Chapter, at a luncheon in his honor at the Algonquin Club in Boston on August 28. The award was in recognition of Mr. Wansker's outstanding work as chief planner, organizer and general chairman of the 11th Annual Meeting of the Association which was held in Boston June 14-15.

The citation, referring to the meeting as outstanding for promotion of good relations between the Armed Services and Industry, states that Mr. Wansker's enthusiasm, zeal, tact and understanding contributed greatly to the "immense success of the conference."

The presentation was made by Col. William E. R. Sullivan, Deputy Chief Chemical Officer. Among those present were high officials of Mr. Wansker's Company, the United-Carr Fastener Corporation, in which he holds the position of Director of Government Relations, and Lt. Col. G. T. Klemm, Commanding Officer Boston Army Base and Major Robert C. Braden, Officer-in-Charge of the Boston Office of the New York Chemical Corps Procurement District.

CLEVELAND CHAPTER

Mr. R. H. Armor, of Diamond Alkali Co., Cleveland O., was elected president of Cleveland Chapter of A.F.C.A. on May 25. Other officers elected are: 1st vice president, Mr. F. M. Dougherty, Ferro Corporation; 2nd vice president, Mr. C. H. Alexander, B. F. Goodrich Chemical Co.; secretary-treasurer, Mr. G. C. Whitaker, Harshaw Chemical Co.; Directors—Mr. R. S. Keller, Industrial Service Co.; Mr. L. C. Turnock, Jr., Cyrus Eaton Co.; Mr. R. B. Waddell, Harris Seybold Co.

BALTIMORE-ARMY CHEMICAL CENTER HAVE JOINT MEETING AT EDGEWOOD

Baltimore Chapter members of the A.F.C.A. were guests of the Army Chemical Center (Edgewood, Md.) during the afternoon and evening of June 6. Representing six of Baltimore's largest industries*, and accompanied by key military and civilian personnel of the Center, the group toured the installation during the afternoon. Principals in the tour were Brigadier General Marshall Stubbs, Commanding General, Chemical Corps Materiel Command; Mr. O. J. Theobald, Olin Mathieson Chemical Corporation, President of the Baltimore Chapter; and Lt. Colonel A. C. Hamilton, Acting President of the Army Chemical Center Chapter. One of the highlights of the tour was a visit to the Anti-Aircraft Artillery's NIKE site, which included a demonstration of simulated radar operation and missile launching.

Baltimore Visitors at Chemical Center Plant: (Left to right) Mr. J. B. Hildebrandt, Flight Refueling, Inc., Mr. J. A. Wascavage, Air Arm Div., Westinghouse Electric Co.; Mr. R. H. Turk and Mr. G. S. Huber, Pemco Corporation (all from Baltimore); Mr. Joseph Ambrose, Chief, and Mr. Edgar Streett, Mfg. and Filling Branch, Production Div., Edgewood Arsenal.

*Olin Mathieson Corp., Pemco Corp., Diamond Alkali Co., Davison Chemical Corp., Western Electric Corp., Flight Refueling, Inc., Armstrong Cork, Lansdale, Pa.

Members and guests of the Association, numbering approximately 100 persons, attended a cocktail hour and dinner at the Officers' Club in the evening, as guests of Colonel W. L. Maclachlan, Deputy Post Commander. Mr. G. L. Cole, 2nd vice president of the Baltimore Chapter, presented a plaque to Mr. Theobald for meritorious service to the Association during 1956. General Stubbs heartily endorsed the day's activity and expressed his hope that the two chapters would combine their efforts to further the objective of the Association to establish and maintain good relationship between the Chemical Corps and private industry. He further indicated that such association can materially assist in the resolution of technical problems of both the Chemical Corps and industry.

The meeting was concluded with the showing of various Chemical Corps weapons and equipment in operation.

FT. McCLELLAN CHAPTER

Colonel Maurice A. Peerenboom, Chief Executive Division, Chemical Corps School, was elected president of Ft. McClellan Chapter of A.F.C.A. at the annual meeting in July. Lt. Col. Truett K. Grant, Executive Officer of the School, was made Secretary-Treasurer. Other new officers elected are: Lt. Col. Albert B. Del Monte, First Vice-President; Mr. Virgil C. Adams Jr., Second Vice-President. The new Directors are: Col. R. D. Chapman, Mr. Marshall K. Hunter, Mr. Bennie C. Ledbetter and Mr. Roger Mallory.

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The new Integration program authorized by the last Congress will enable many reserve officers to obtain Regular commissions in grade above first lieutenant.

NEW OPPORTUNITIES FOR REGULAR ARMY COMMISSIONS

PURSUANT TO THE "Armed Forces Regular Augmentation Act of 1956" (Public Law 737) passed by the 84th Congress, the Army has inaugurated a comprehensive program for integration of additional officers into the Regular service.

The new program provides the first opportunity since the 1946-47 integration for making initial appointments in the Regular Army above the grade of first lieutenant.

The Act increases the Army's statutory Regular male and WAC commissioned officers authorizations (less Army Nurse Corps, Army Medical Specialist Corps and professors at West Point, to none of which groups the Act applies) from 30,600 to 49,500. The present Regular officer strength chargeable against this authorization is about 27,000.

A controlled augmentation program aimed at insuring a balanced officer structure and avoiding the pronounced "humps" which have caused promotion difficulty in the past has been approved by the Secretary of Defense and the President. Manning level goals have been fixed as follows:

(1) 72% of statutory authorization, or 35,640, by July 1958

(2) 80% of authorization or 39,600 by 1963

The President has decided to withhold approval of procurement of officers beyond the 1963 goal of 39,600 until the Army's Regular officer strength approaches that figure.

The program is of interest to Reserve or National Guard officers, former Army officers and civilians who may desire Regular Army commissions, as well as to officers now on the active Regular list of the Army. It is expected that the chief source to fill vacancies to achieve the goal of 39,600 by 1963 will be reserve component officers on active duty. However, the first step in augmentation is to increase the normal annual procurement of junior officers from established sources. This has already been initiated.

While appointments under the Act may be made without restriction as to permanent grade, the Army plans to appoint only in grades below general officer. It is stated that, at present, under the provisions of the Act, no officer could qualify for original appointment above the permanent grade of colonel.

The Act establishes certain eligibility requirements with respect to age at appointment in relation to previous service, on the basis of which acceptability of an applicant for appointment and his (or her) grade and seniority for promotion are in part determined.

First, it is provided that the age of an officer appointed under this Act must be such as to permit him to complete twenty years of active commissioned service before his 55th birthday. This may include periods of service both before and after appointment.

Next, there is a "basic maximum" age of twenty-seven (27) that enters into the age-service eligibility considerations. This arises from the fact that, except for Veterinaries, Chaplains, Judge Advocate General and Medical Specialists Corps personnel (for whom provisions of previous laws and policy continue to apply) the maximum age for appointment with no "promotion list" service credit is twenty-seven years. Accordingly, for an applicant above the age of twenty-seven to qualify for appointment, he must be eligible to receive a promotion list service credit equal to the difference in years between his actual age at appointment and twenty-seven. Such an applicant may, *in the discretion of the Secretary of the Army*, be credited with his active commissioned service after 6 December 1941 and his twenty-first (21st) birthday. He may also be given one of three types of "constructive credit."

The first type of constructive credit allows a commissioned officer on active duty on the effective date of the Act (20 July 1956) to receive credit for a period, not to exceed eight years, equal to the amount by which his commissioned service creditable for basic pay exceeds his active commissioned service.

The second constructive credit provision permits granting up to eight years of such credit to not more than 200 outstanding specialists in critical fields, such as nuclear physics, electronics, etc., in accordance with criteria prescribed by the Secretary of the Army and approved by the President. Detailed information about the selection of this limited group is to be announced later by the Department of the Army in a special circular. In the case of all appointments, other than the specialists, no officer will be appointed in a grade higher than the highest in which he has served satisfactorily on active duty.

The third provision for constructive credit permits granting of not more than two years of such credit to appointees who do not qualify under either of the other two constructive credit provisions.

The integration procedure planned provides for decentralization to major Army Commands of the initial administrative processing of applications but for centralization of selection, utilizing boards of mature officers working under the supervision of the Chief, Career Management Division, Office of the Adjutant-General.

The program is not automatic. To be considered, an individual desiring appointment must submit an application on his own initiative.

The tentative time-schedule for carrying out the program is as follows:

1 October 1956 to January 31, 1957, submission of applications.

November 1956 through March 1957—processing of applications by major commands, including educational tests and interviews as may be necessary, with rejection at that level of those found ineligible.

December 1956 through April 1957—processing by the Adjutant-General.

January through October 1957—action by selection boards, the first group of boards to determine which applicants are fully qualified and another group of boards to make final selections.

November 1957 through May 1958—such background investigations and physical examinations as may be necessary, preparation of nomination lists and consummation of appointments.

The Army is issuing a circular of information on the program which will be given wide distribution.

THE U. S. ARMY FLAG

Although various elements of the Army, from groups and corps down to separate battalions, have their colors and distinguishing flags, none has previously served for the Army as a whole. The new United States Army flag is designed to meet the need for a flag which will represent the entire Army on appropriate occasions.

The Army flag is made up in the National colors—red, white, and blue— with a yellow fringe. It is the standard size for colors: 4 feet, 4 inches hoist and 5 feet 6 inches fly. It bears 145 streamers of ribbons representing the campaigns in which the Army has participated.

The flag is made of white silk, upon which is embroidered in blue, a replica of the official seal of the War Office. Beneath the seal is a broad scarlet scroll bearing the inscription in white "United States Army." Beneath the scroll, in blue Arabic numerals, is "1775," the year in which the Army was created with the appointment of General George Washington as Commander-in-Chief.

The new Army flag was designed by the Heraldic Branch, Office of Research and Development, Office of the Quartermaster General. Research on background material was begun in July, 1955. Several tentative designs were developed and from among these the design as adopted was selected by Secretary of the Army Brucker.

DR. RAGNAR ROLLEFSON NAMED CHIEF SCIENTIST OF ARMY

Dr. Ragnar Rollefson, formerly of the University of Wisconsin and long connected with research projects, has been named Chief Scientist of the U. S. Army, occupying the position formerly held by Dr. John E. Vance, who returned to New York University in 1955.

Dr. Rollefson served with the University of Wisconsin in various capacities since 1926 and was appointed Chairman of the Department of Physics in 1947. He was on leave of absence to work on government projects during several periods since 1942. He has received the Presidential Certificate of Merit and a citation from the Chief of Staff, U. S. Air Force.

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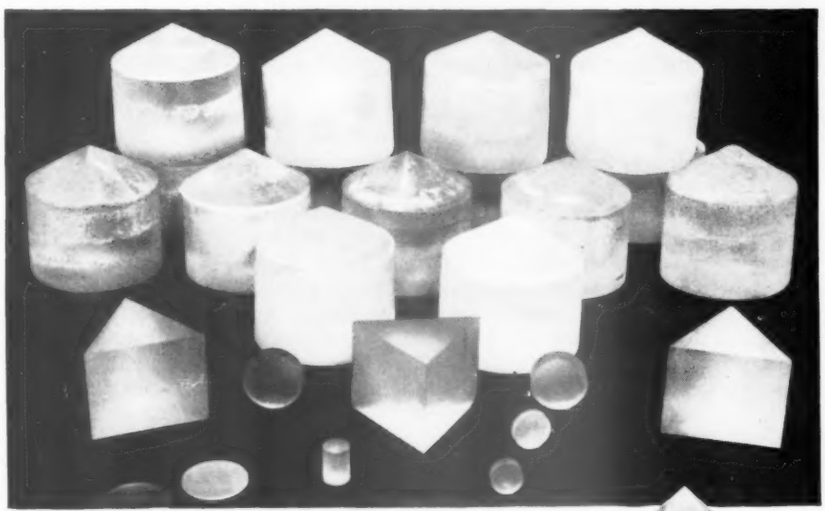

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Potassium Bromide
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Potassium Iodide
Silver Chloride
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Lithium Fluoride
Barium Fluoride
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Cesium Iodide
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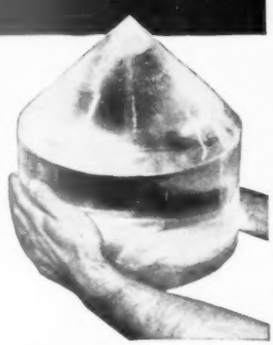

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THE ROLE OF THE CHEMIST IN ATOMIC ENERGY

Fabian Bachrach

By **Dr. Willard F. Libby**

Commissioner U. S. Atomic Energy Commission

(The need for "highly skilled and gifted" chemists in the atomic energy field is emphasized by Dr. Libby in this address prepared for delivery before the California Section of the American Chemical Society, Berkeley, California August 13.)

CHEMICAL JOBS

1. Source Materials.

From the time the uranium ore is mined, converted to U_3O_8 or to diuranate in the mill, refined to high purity uranium trioxide, hydrofluorinated to uranium tetrafluoride and reduced to uranium metal, to be placed in a reactor or further fluorinated to uranium hexafluoride to be placed in the gaseous diffusion plant for enrichment, the chemist is busily at work on atomic energy. His work continues beyond this point, too, for the irradiated fuel elements must finally be dissolved and the fission products and plutonium and unreacted uranium all separated. It is quite a business. Taken as a whole it approaches some of our larger chemical occupations in magnitude.

Upon completion of projects now under way, or definitely planned, production by the free world should be in excess of 30,000 tons of U_3O_8 per year. Today ore production for the United States alone is at a rate of nearly 3 million tons per year and is expected to reach 5 or 6 million tons. The Atomic Energy Commission has asked industry to get into the business of making uranium tetrafluoride and/or uranium hexafluoride. Proposals for deliveries totaling 5,000 tons per year of U_3O_8 equivalent of these two salts (or an interim basis, uranium trioxide) are desired as of October 1, 1956. To many chemists 15 tons per day may seem like a small operation, as indeed it would be for a heavy chemical. However, we are speaking here of products of very high purity—pharmaceutical standards at the very least.

Industry's response to this request has been gratifying. At the present time some 32 firms are actively interested and we anticipate perhaps as many as a dozen proposals.

2. Atomic Power.

There are other tasks also. Irradiated thorium blanket must be processed for uranium-233 and plutonium fuel elements must be developed and their processing mastered. We understand from our knowledge gained from atomic weapons how to make plutonium metal parts, but it is not so clear what the irradiation effects, especially at high burn-ups, may amount to and it is not at all obvious that plutonium with its toxicity can be used as a fuel conveniently. A very considerable job remains for the chemist to do in the methods of manufacturing plutonium fuel elements and processing them after the irradiations are completed. All manner of alloys must be tested and various devices for the prevention of the escape of plutonium in the case of accidents incorporated. The possibility of utilizing plutonium in atomic power piles certainly exists. The necessity of doing so is not so obvious. Let us consider this for a moment and thereby illustrate how vital is the chemist's role in the Peaceful Uses of the atom.

The Nautilus reactor operates on highly enriched uranium and as a result makes very little plutonium. (Plutonium is manufactured by neutrons interacting with ordinary uranium-238.) However, the cost of uranium-235 is such that one cannot imagine economic power being generated indefinitely by the burning of uranium-235 alone. Some dividends must be obtained and the one normally envisaged is plutonium-239, which in itself is fissionable and therefore burnable as a fuel. Most power pile designs operate with uranium containing less than 20 percent of the isotope 235 on the average. (The power bilateral Agreements for Cooperation stipulate that the uranium-235 furnished by the U.S. Atomic Energy Commission will not exceed 20 percent in concentration except for limited amounts to be used in research and development test reactors). Something like one-half of an atom of plutonium is made for every uranium-235 atom fissioned in most power reactors likely to find wide use in the near future. So, one kilogram of uranium-235 makes 500 grams of plutonium. This yield will vary with design and it may be that some reactors will yield as much as 800 grams of plutonium per kilogram of uranium-235 burned, or as little as 200 grams. It is even possible that some reactors will produce more fissionable material than they burn. The fact is that in power piles which do not use highly enriched uranium a great deal of plutonium will be made.

Now, at the moment, the only use for plutonium known is in atomic weapons. No country has yet developed the technology of burning plutonium. It may seem that the atomic weapons business could take up the plutonium. This is the course the British Atomic Energy Authority has taken in their reactors at Calder Hall and the credit given for the plutonium produced is such that the electric power from the reactor is not too expensive. It is clear, however, that the problem of what to do with the plutonium still remains. Suppose, for example, that

atomic power was segregated from weapons activities as being a Peaceful Use. Then we would have to say that plutonium generated from the reactors was not to be used for atomic weapons. What would then be its value? Obviously nearly zero, unless we knew how to burn it for power. At the moment we do not, and so the chemist's role in atomic power would become a most vital one in this case, for it is the chemist who will have to tell us how to handle the plutonium in view of its extremely poisonous characteristics.

One might envisage that the plutonium made by atomic power piles could be taken into the weapons stockpile to such an extent that one would never need to burn it for atomic power. Let us consider the numbers. Roughly speaking, a kilowatt for one year amounts to 1 gram of uranium-235 or plutonium-239 being fissioned. Therefore, for the present consumption of electric power in this country, which is about 70 million kilowatt years, if this were all atomic power, the fission of about 70,000 kilograms of uranium-235 or plutonium-239 annually would be involved, with the production of about 30,000 kilograms of plutonium-239 as a by-product. It is completely obvious, therefore, that if atomic power is successful and it uses uranium of modest enrichment, enormous quantities of plutonium will be generated. This may well exceed the market in the weapons stockpile requirements, particularly if our hopes that the peace will continue indefinitely are justified. Therefore, the problem remains with us in either case. In order that plutonium be of any value it is necessary that the chemist learn how to solve the problems involved in using it for atomic power. So chemists should be working on how to handle plutonium as a high priority matter in the development of atomic power.

Reactors delivering atomic power must work at elevated temperatures in order that a proper thermodynamic efficiency be possible. As a result, the materials of which the reactors consist must operate at such temperatures and the chemist's and chemical engineer's role in atomic power, at least in principal part, centers on the chemical reactions which occur at such elevated temperatures.

In most applications of chemistry in the modern technological world, the backlog of information available on performance at ordinary temperatures is adequate for the preliminary estimates of the important reactions which will be involved and the preliminary selection of the materials of construction and the procedures to be utilized in a project. This is not true in atomic power plants for the simple reason that there is no adequate backlog of basic chemical information at elevated temperatures. This is despite the excellent work done in recent years at Oak Ridge and other laboratories.

It is not possible to predict with any reliability the relative volatilities, thermodynamic free energies, or even the molecular formulas of the compounds which are likely to result from a given mixture of elements heated at temperatures between 500 and 1,000 degrees centigrade or above. It is true, of course, that isolated portions of this great field have been mapped. In particular, the geochemists in their studies of the reactions involved in the earth's crust have done a great deal. Also, the engineers interested in the development of jet engines as well as several other groups in industry have contributed sizeable amounts of information, but the sweep of the whole field is so great, however, that it is true that great areas exist where simply nothing is known. For example, the problems of the solubilities of metals in salts at these elevated temperatures, of the solubilities of gases in metals, and of gases in salts, the problems of the rates of chemical reactions proceeding at these temperatures, of the relative densities, the lattice structures, and the other physical properties of the various phases of almost any given compound at these temperatures—nearly all of these are without any general delineations.

We urge that chemists throughout the country join in a broad program on the investigation of the chemistry of high temperature systems on an unclassified basis; the program to be pursued over a period of years with the thought in mind that in the not too distant future it will pay its way, by solving some of the very critical problems of atomic power. Many people have said and many people understand that atomic power will never be at its cheapest until the best chemical processing is incorporated and utilized to the fullest extent. Homogeneous or fluidized reactors of various sorts have been proposed for the very reason that they bring chemical techniques to the fore.

Research programs of this sort are relatively inexpensive in terms of the monies appropriated for the various reactor projects. The entire program for the support of fundamental physical research, both chemistry and physics, of the Atomic Energy Commission is less than $50 million per year. This, as you know, is not a large amount of money in terms of the amount spent on power reactors and the development of atomic power of every kind. We can anticipate, therefore, finding such a program economical and worth while.

Another problem in Atomic Power is the question of corrosion in the various atomic power reactors being designed, built and considered. It is an interesting game that is being played. On the one hand a group of metallurgists, who of course are very akin to chemists in training and thought and conditioning, are asked to make a completely non-corrodible fuel element; and on the other hand a group of process chemists are asked to dissolve this non-corrodible fuel element and process it for a minimum cost. This conflict seems to force the use of new degrees of freedom such as are involved in high temperature processing, special dissolution methods, and the use of alloys with specific coolants which are inert to the dissolving reagent. It really puts the chemist to test and it is to his credit that he has made the progress that has been made to date. Nevertheless, it is obvious that this kind of conflict is somewhat unnatural and to be avoided if possible. There is one way to avoid it that is obvious, and that is to use the homogeneous reactor principle. Avoid heterogeneous fuel elements and the problem of their manufacture and dissolution and in this way one avoids the wasteful conflict considered above.

The homogeneous reactor is, of course, a family of reactors and may include anything in the way of fluidized or dissolved liquid fuels with fixed or moving moderators and with or without continuous processing of the fluid fuel as it circulates through the reactor. There are many possible variations of the homogeneous reactor, and the Commission is investigating the more promising of these. But, speaking broadly, the homogeneous reactor is the chemist's reactor, and it will be the chemist who makes it work. It is my opinion that a type of homogeneous reactor will give the cheapest atomic power in the end. We are at the point now where most of the reactors being built in Britain, Russia and the United States are heterogeneous. There seems to be a natural development in this direction, and even though the homogeneous appears to have the best chance, the fact remains that it is difficult to proceed with it until some of the chemical problems involved in specific designs have been solved.

(Continued on page 25)

THE CHEMICAL DIVISIONS OF FOOD MACHINERY AND CHEMICAL CORPORATION

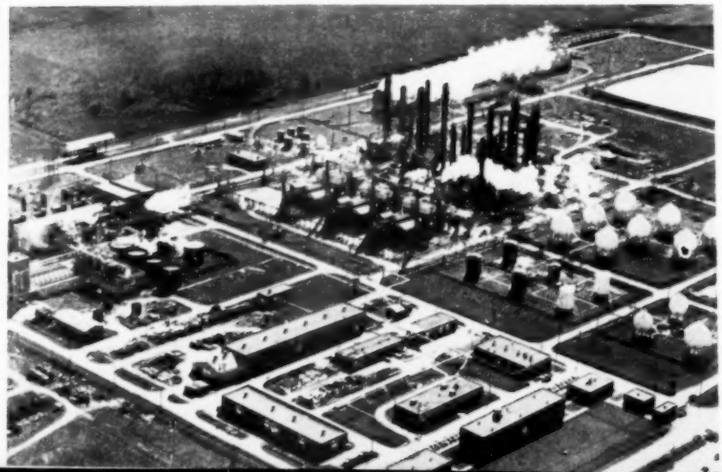
Chemical Divisions—Central Research Laboratory, Princeton, New Jersey

By A. T. LOEFFLER
Vice President
Food Machinery and Chemical Corporation

LITTLE MORE THAN A DOZEN YEARS AGO, FMC was known chiefly as a designer and manufacturer of diversified machinery and equipment for numerous industrial and agricultural markets. Today—though an increasingly significant factor in the field of mechanical products—FMC ranks among the nation's major chemical producers.

Operations of FMC Chemical Divisions now cover a wide range of organic and inorganic chemicals for industry and agriculture. Though the corporate name is relatively new insofar as chemicals are concerned, the Divisional names of our chemical operations are in the main well-known in many industry fields. Under the FMC banner, these divisions have prospered and expanded significantly and such new names as *Fairfield* in pesticide concentrates and organic chemicals, and *Petro-Tex*, a joint FMC and Tennessee Gas Transmission Company venture, have since been added to the overall picture.

Petro-Tex Chemical Corporation Butadiene Plant, Houston, Texas



The origin of FMC dates back to two separate events in the 1880's. In the West, an observant inventor saw an agricultural need and developed a sprayer for orchards. So popular was the sprayer that the inventor, John Bean, organized a small company in Santa Clara Valley, California, where he began to produce spray pumps for nearby fruit growers.

At the same time, in the East, Dr. Warner, a young physician, purchased a West Indian island rich in minerals. The doctor founded a chemical company in New Jersey to produce sodium phosphates and related products from his island reserves.

Years passed, and the John Bean activities in the West and the Warner activities in the East prospered along their individual ways.

By 1928, the original John Bean Spray Company, now increased greatly in stature, was reorganized and merged with a western producer of dried fruit and canning equipment. In 1929, the organization was named the Food Machinery Corporation.

The young corporation then began a carefully planned program of growth and expansion. In the twenty years that followed, internal development of products was implemented by acquiring certain outstanding companies producing goods which FMC could improve, extend and integrate into its own lines. Among those integrated were Niagara Sprayer and Chemical Company, later the Niagara Chemical Division of FMC, a major

This is the sixth in a series of articles on the origin, development, and product fields of the sustaining member companies of the Armed Forces Chemical Association which reflect the vital role of chemical science and industry in the National Defense. The next article in this series is scheduled for the November-December issue.—Ed.

producer of insecticides, fungicides, herbicides and agricultural dusting equipment.

In 1948, FMC took a major step in the direction of consumable products which would help counter-balance apparent cyclic fluctuation in the demand for capital goods and which would also provide a broader supply base for the company's existing agricultural chemicals operation. The Westvaco Chemical Corporation, the direct outgrowth of Dr. Warner's original chemical company, was now making phosphates, barium and magnesium chemicals, alkalis, chlorine, solvents and various organic chemicals. Westvaco was merged into FMC, which was re-named Food Machinery and Chemical Corporation. Westvaco was subsequently reconstituted as two separate divisions, the Westvaco Chlor-Alkali and the Westvaco Mineral Products Divisions.

Since that time, FMC has extended its activities into additional machinery and chemical lines. Chemical acquisitions including Ohio-Apex, a leading manufacturer of plasticizers, specialty organic and other chemicals, in 1951, and Buffalo Electro-Chemical (now the Becco Chemical Division), one of the world's major producers of hydrogen peroxide and peroxygen chemicals, in 1952. The Fairfield, Maryland, plant of the U.S. Industrial Chemical Company, a Division of National Distillers, was acquired in 1954. This now constitutes the Fairfield Chemical Division, a major producer of pesticide concentrates and synthetic organic chemicals.

IN 1955, FMC WAS THE successful bidder for the government-owned butadiene plant at Houston, Texas, second largest butadiene plant in the country. The plant has since been further expanded and is now owned and operated by the Petro-Tex Corporation, a joint FMC and Tennessee Gas Transmission Company enterprise.

FMC currently operates 14 manufacturing divisions and 11 subsidiary operations embracing 61 production units strategically located throughout the United States and extending into Canada and Mexico. Overseas activities are centered in Great Britain, Europe, Australia, South Africa and South America. FMC's gross income in 1955 reached 265 million.

From this wide network of manufacturing operations, FMC markets a variety of products for nearly every type of agricultural and industrial market, including many products in the home owner field. There are three major operational classifications. These deal with Machinery, Defense Materiel, and Chemicals.

The Machinery and equipment group of FMC divisions, which accounted for 32.0% of the organization's gross in 1955 (in addition to 3.3% from leased machinery), makes *Bolens, M-E, Mow-Master* and *Propulsion* Outdoor Power Equipment; *FMC* Food Canning, Freezing and Kitchen Equipment; Industrial Castings, and Fresh Fruit and Vegetable Packing and Processing Lines. Other major products are *John Bean* Agricultural, Automotive and Fire Fighting Equipment; *Oakes* Poultry and Hog Raising Equipment; *Peerless* Pumps and Water Systems; *Chicago* Waste Disposal Equipment; *Shur-Rane* Irrigation Systems; *Stokes and Smith, Simplex* and *K & D* Packaging Equipment; and *Chiksan* and *Weco* specialty oil field equipment.

A second arm of FMC, defense production (17% of the 1955 gross), is an important supplier of products for the Armed Forces. In World War II, FMC designed and made the "Water Buffalo" amphibious tank. FMC's M59, an armored infantry vehicle, is now supplied on a mass-produced basis to Army Ordnance.

Finally, there are the six Chemical Divisions of FMC which accounted for 47.7% of the corporation's gross in 1955. These are described below.

Niagara Chemical Division—Headquarters Middleport, New York

Niagara Chemical Division

Niagara Chemical Division is a leading producer of agricultural insecticides and fungicides, industrial sulfurs and weed killers, as well as of various kinds of dusters. In addition, Niagara prides itself on selling service. Among citrus growers in Florida, cotton farmers in the Mississippi Delta, orchardists in the East and Pacific Northwest and throughout our nation's agriculture—the Niagara sales representative serves as family doctor for the ills of crop-damaging insects, weeds and diseases.

Niagara Chemical Division directs all of its extensive research and meticulously-controlled production toward equipping its corps of field technicians with the knowledge and the materials to combat these costly ravages. From the original operation started at Middleport, New York, in 1904, to serve only the Western New York Fruit belt, Niagara has grown until it is today one of the major agricultural chemical producers in the United States. In addition, it operates subsidiaries in both Canada and Mexico and exports products to 61 other nations of the world.

Niagara formulates insecticides and fungicides to protect essentially every food, fiber and ornamental crop grown in the United States. Its secondary lines are herbicides for selective weed control, fumigants for control of soil-borne insects, small package pesticides for household and garden use, and industrial sulfur for rubber vulcanization. Niagara dusting equipment ranges in size from small hand-operated units to huge tractor drawn

Westvaco Mineral Products Division, Phosphorus Plant, Pocatello, Idaho.

Westvaco Chlor—Alkali Division Soda Ash Plant Green River, Wyoming

machines. Incidentally, much of Niagara's liquid materials are applied by the widely-used Bean Sprayers manufactured by FMC's John Bean Division.

IF THE SALES REPRESENTATIVE can be called a family doctor, the role of Niagara's production department compares with that of the neighborhood druggist. Niagara produces over 800 different specific formulations. As many of the ingredients would be quite harmful or completely ineffective if used in improper proportions, there is great emphasis on quality control. Niagara's own standards of tolerance are tougher than those imposed by any of the state or federal quality control requirements.

The major production plants for preparing dry pesticide materials are located at Middleport, N. Y.; Jacksonville, Fla.; Richmond, Calif.; Harlingen, Tex.; and Belle Chasse, La. Finished materials are shipped directly to customers, and base materials to smaller mixing plants throughout the United States, Canada and Mexico. Liquid concentrates, oil emulsions and arsenicals are also produced at some of these locations. A Niagara plant at Pine Bluff, Ark., makes technical grade DDT for shipment to its many customers throughout the United States and many foreign countries.

The agricultural chemicals industry, prior to World War II, was fairly stable, with a relatively small number of quite well-established products such as calcium and lead arsenate, sulfur, the various copper fungicides and the natural occurring pyrethrins and rotenone. Immediately following the war, the industry was revolutionized by the appearance of DDT, BHC and many other organic insecticides, fungicides and herbicides. The search for new pesticides continues at an ever-increasing rate, and Niagara Chemical Division is taking an active part.

Some of the important raw materials for Niagara's formulations come from other FMC Chemical Divisions. The South Charleston plant of Westvaco Chlor-Alkali provides the active insecticide materials BHC and TEPP. Westvaco Mineral Products Division provides three grades of fillers, the soil fumigant ethylene dibromide and the fungicide material sodium polysulfide. Niagara buys from the Fairfield Chemical Division the organic insecticides pyrethrum, rotenone, allethrin and piperonyl butoxide, chloro IPC and IPC herbicides.

Westvaco Mineral Products Division

Phosphates, barium chemicals and magnesia products made by the Westvaco Mineral Products Division are used in essentially every American industry for scores of widely varied products and processes. The largest tonnage chemicals produced by this Division, sodium tripolyphosphate (STPP) and tetrasodium pyrophosphate (TSPP) are major components of household detergents, and go into the making of many familiar brands.

The Division, in fact, markets a variety of sodium phosphates, potassium phosphates and phosphoric acid. The latter, in a food grade, puts the sparkle into cola-type beverages. Phosphoric acid's most promising outlet, however, is in agriculture where its use in fertilizers and cattle feeds is gaining recognition. In addition, the number of industrial uses for the acid continue to grow daily. Sodium phosphates are used in a surprising assortment of otherwise unrelated products: gelatins, instant puddings, oil-drilling muds, clay for coated "slick" paper, compounds for treating boiler water and refinery catalytic agents. Potassium phosphates are used in making synthetic rubber, fine grade liquid shampoos and facial soaps. Westvaco Mineral Products also makes a line of leavening agents (based on sodium acid pyrophosphate) marketed by the subsidiary Monarch Chemical Company.

Magnesia products produced by this division are used for high temperature refractory brick, oxychloride flooring cement, and lightweight roofing material. An adsorptive grade has applications in decolorizing and purifying processes.

Barium oxide and hydrate, largest volume barium products, are sold almost exclusively for the production of additives for high detergency motor oils and greases. Barium sulfate is used as a filler for paints and inks, barium carbonate in optical glass and brick making, barium sulfide in luminous paint and rubber vulcanization, barium nitrate in fireworks and tracer ammunition. A co-product, sodium sulfide, has uses in tanning and dye manufacture.

THE ORIGINS OF THE PRESENT Westvaco Mineral Products Division are quite diverse. The earliest venture was at the turn of the century when the Warner Chemical Company began the first commercial manufacture of phosphoric acid and sodium phosphates in the United States at Carteret, N.J. In 1902, for the first time anywhere, sodium acid pyrophosphate for the baking trade

was made at Carteret. Other predecessors were a maker of hydrogen peroxide and barium oxide at San Francisco and Modesto, Calif., and a concern making magnesium oxide for oxychloride cement flooring at Newark, Calif.

After becoming part of FMC, Westvaco was the first major chemical company to tap the vast phosphate shale deposits of the West. Prior to the start-up of the first phosphorus furnace at Pocatello, Idaho, in August 1949, FMC had not made a pound of elemental phosphorus. Today through Westvaco Mineral Products Division, we are one of the nation's largest producers. The first furnace, built on a TVA design, was followed by three others designed by our engineers, all of which were in production by 1952.

Integrated with the production of elemental phosphorus, new phosphate conversion plants were built at Newark, Calif. and at Lawrence, Kan., and greatly expanded and modernized facilities were installed at Carteret.

A small proportion of our elemental phosphorus is sold to Ohio-Apex for the manufacture of plasticizers and to the government for defense uses, but the bulk of it is shipped by tank car to Newark, Lawrence and Carteret where it is converted to phosphoric acid. The various sodium and potassium phosphates are produced by the reaction of phosphoric acid with soda ash or caustic potash, products of our Westvaco Chlor-Alkali Division. At Lawrence, we also operate a dry ice plant. The raw material is carbon dioxide evolved in the reaction between phosphoric acid and soda ash.

The production capacity of barium oxide and hydrate at our Modesto plant has been doubled in the last two years as a result of an expansion program, and further modernization is in progress. Hydrogen peroxide is no longer made at Modesto, but our San Francisco plant still bottles hydrogen peroxide purchased from the Becco Chemical Division.

Magnesia products produced at Newark include refractories, various grades of lightburn, as well as by-product gypsum and ethylene dibromide. Much of the latter goes to Niagara Chemical Division for use in insecticide formulations. The Division still makes magnesium chloride for oxychloride cement. Industrial demand for magnesium chloride is increasing, however, particularly due to the development in the last two years of cotton plant defoliants in which it plays an important part as the fire preventive ingredient. Lightburned magnesium oxide finds an important use in paper manufacture.

The raw materials situation is excellent for all operations of the Division. The Division currently has raw material sufficient to assure continued operation of the Pocatello furnaces for more than 50 years. Recently, Westvaco Mineral Products leased one of the largest deposits of barite in the West, located near Battle Mountain, Nevada. These reserves are sufficient to last for decades to come. The sources of seawater bittern are as inxhaustible as seawater and sunlight. Dolomite, which is used to provide lime for the reaction plus additional magnesium, is available in ample quantities from our own facilities.

AN IMPORTANT FACTOR in the future of this Division is, of course, research. The research facilities of Westvaco Mineral Products Division are carried out at two widely separated laboratories, one at Newark, California, and the other at Carteret. The geographical location of the Newark laboratory makes it an important center for applications research in connection with Western products and markets, and to some extent in connection with all of the Division's products. At Carteret, research is aimed at further exploitation of important markets and at diversification based upon present and potential raw materials.

Westvaco Chlor-Alkali Division

Westvaco Chlor-Alkali Division has two manufacturing sites, each with unique characteristics. The South Charleston, West Virginia, plant is the largest FMC Chemical plant. The mining and processing operation at Green River, Wyoming, represents the first new and en-

(Continued on page 22)

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EXECUTIVE DEVELOPMENT IN THE CHEMICAL CORPS

U.S. Army Photo

At the opening-day of Management Sub-course of the Chemical Corps School—Left to Right: Col. Frank Arthur, Chief, Career Management Division, Office of Chief Chemical Officer, Washington, D. C.; Brig. Gen Marshall Stubbs, Commanding General, Materiel Command, Army Chemical Center, Md.; Brig. Gen. (Ret.) John R. Beishline, Professor of Business Administration, University of Texas; Col. Edwin Van Keuren, then Commandant of the Chemical School, now retired.

By

CHARLES A. MORGAN, JR., LT. COL.

The current emphasis on management principles and techniques both in industry and government is reflected in the establishment of a new course in management at the Chemical Corps School. Herein Colonel Morgan, Assistant to the Chief, Military Arts Division for Management, Chemical Corps School, describes the conduct of the first class in this subject which is expected to be a permanent part of the School's curriculum.—Ed.

THE ESTABLISHMENT of the Management Course by the Chemical Corps School in August 1955 opened a new era in training of future Commanders-Managers in the Chemical Corps. Although each Chemical Corps Command has done a fine job in training its military and civilian personnel in the functions for which they are responsible, there has been no one organization in the Corps responsible for the development of potential commanders and managers where all the principles of good management could be assembled, their interrelationship examined, and where a philosophy of sound and practical management could be developed and expounded. It is true that the Corps has for many years utilized the facilities of various graduate schools of business administration and on-the-job training in industry, but the number of personnel who could be afforded such training was very limited. Likewise, this training normally did not consider problems peculiar to the Chemical Corps and to the Army.

Just why is there a need for executive development in the Chemical Corps?

We in the Chemical Corps fully realize the great advantage offered an aggressor who will use biological and chemical weapons in conjunction with nuclear weapons and "conventional" explosives. Since it is upon our shoulders that the primary responsibility rests for offensive and defensive chemical, biological, and radiological (CBR) warfare, we must be fully capable of meeting all the demands that are placed upon us by the various elements of the Department of Defense.

These demands require, besides an effective research, development, engineering, procurement, and supply program, good and progressive management within the Corps at all levels, and impose upon the Corps the duty to look toward the future for the effective utilization of all of its resources, particularly its human resources.

The Corps therefore must establish and cultivate an effective executive development program for its junior civilian and military personnel, so that they can continue to lead the Corps to greater heights of achievement.

Realizing that our future is dependent upon the professional development of junior personnel, in the Spring of 1955, a survey was conducted of the Corps' military education to determine the types of courses and subjects that the Chemical Corps School should teach and to evaluate the effectiveness of its present instruction. To accomplish this study, a civilian research organization was retained. From its study and report and from another study of the recommendations of former graduates, made by the Research and Analysis Division of the Chemical Corps School, one major recommendation continually appeared in the analyses—the need for General Management and Financial Management Training.

This recommendation was acted upon by the School and a recognized Management Consultant, one experienced in governmental, industrial and university procedures was sought to provide the proper management prospectus, advice, and guidance to the Staff and Faculty in the preparation and conduct of a dynamic Management Course of Instruction. Through the facilities of the Chief, Plans, Training and Intelligence Division, Office Chief Chemical Officer (Colonel Frank M. Arthur), Mr. Joe Lee Jessup, Assistant Dean of the George Washington University School of Government, and Coordinator of the Air Forces Resources Management Program, was retained as the School's Consultant for Management.

FOLLOWING his appointment, a thorough survey was made by the School's Management Planning Staff of the Chemical Corps Commands and Activities, and the comments of all Chemical Officers were solicited as to what they considered essential in the Management Field for presentation at the Chemical Corps School. From the survey and comments, a planning curriculum and objectives were prepared and adopted by the Corps after a series of Corps-wide conferences. The objectives of the

Management Course for the Tenth Chemical Officers Advanced Course were set as follows:

1. To provide sound and practical Command-Management Leadership, philosophy, and techniques pertaining to non-tactical situations and to familiarize the students with the application of such philosophy and techniques to the Chemical Corps.

2. To provide a review and an understanding of human relations, communications, and management development principles and techniques to insure their maximum utilization for the material betterment of the individual officer and in turn for the Chemical Corps.

3. To provide an understanding of the National Resources situation, some problems that develop therefrom, and their impact on the military service.

4. To provide an appreciation and understanding of the Department of the Army's management techniques including program management, financial management, and management improvement for application at all activity levels within the Chemical Corps.

5. To provide practice in the application of these management principles and techniques by case studies and seminar sessions.

The planning staff divided the curriculum for the Management Subcourse into seven major segments for organizational and presentation purposes as follows:

General Management; National Resources; Human Relations; Communications; Management Development; Management Techniques; Industrial Field Trips.

In the General Management Section, a broad area, the philosophy of management, the tasks and functions of management (planning and forecasting, organizing, integrating, and controlling) were presented from an academic and practical approach. To further set the stage for management thought, the measure and nature of good management in the military was stressed and defined as—the proper utilization of men, money, and material for the accomplishment of the mission. The industrial viewpoint of increased profits and dividends was paraphrased to mean lower costs and more effective, efficient, and economical operations to accomplish the job.

The National Resources area presented the varied problems that face a commander and our Country; the effect of the shortage of manpower and material resources upon the Nation and its resultant effect upon the Chemical Corps; and some of the operational problems in defense mobilization and the impact of our National defense upon the American economy.

Human relations covered what we consider to be the basic considerations of human relations and how these considerations can be applied in order to achieve a more effective and efficient organization. Likewise how an individual may grow in stature among his fellow men through the application of these considerations.

In the very important area of Communications, we stressed the ways and means one can take to improve them and to make them more effective whether they be oral or written, up, down, or across organizational lines.

UNDER MANAGEMENT DEVELOPMENT or Executive Development, we presented its need and importance, for this is an area where the government and industry are each spending considerable sums of money. The purpose behind development and what we hope to achieve by our executive development program was explained. In this area we also presented, as in other areas, the dual approach—what industry is doing as well as what we, the military are doing. Likewise, we considered methods an individual may take to improve himself, since it is a well known fact that ninety percent of one's professional development is through one's own efforts.

In Management Techniques, we presented some of the Department of the Army tools of management, demonstrating how a commander-manager could do his job better through the understanding and appreciation of the tools and how they can work for him. The three major areas covered were Program Management, Financial Management, and Management Engineering.

The final segment was the conduct of the class through various industrial organizations, such as Republic Steel Company, Gadsden, Alabama; Coosa River Newsprint Plant, Coosa Pines, Alabama; General Electric Tube Plant and Alabama Pipe Company, Anniston, Alabama. Students thus observed the principles and techniques of management in operation.

Two vehicles of instruction were utilized—guest speakers and the case study method used in graduate schools of business administration. Although the case study method of instruction is well established in other schools of the Army, such as Command-Management and the Supply Management Schools, it had previously been used in a very limited form in the Chemical Corps School. However, since the management class was composed of selected Chemical Corps Officers and civilians of varying grades drawn from the Chemical Corps Commands, it was considered to be ideally adapted for this type course. Further the planners believed that in the field of management, personal abilities could be improved through study, contemplation, and discussion of actual situations rather than by other study means. We believed that experienced and mature people could not be lectured into being commanders and managers, nor could the appreciation of good management be developed and utilized through the commitment to memory of various rules and precepts of management.

In the case study method, the student is presented with actual situations each differing from those preceding. In each case the students are urged to approach the situation with a free and open mind and are allowed to project themselves into the situation and to think responsibly with regard to the situation and circumstances. The students are compelled to analyze and use the various management techniques which have been considered in the lecture classrooms as well as those from their past experience. The results are free, friendly, and informal discussions. There is no one solution nor is there academic security handed out in the form of "approved school solutions." The process of forming their opinion, exchanging ideas and experiences with others, constructively criticizing other's ideas as well as having their own criticized is a rewarding experience for the students, and through this medium of instruction real learning takes place.

The School utilized printed case studies from several sources including the Command-Management School case studies prepared by Harbridge House, Inc., and "The Administrator," the case book of Harvard Business School. In addition several motion pictures were used for case studies including recent TV presentations.

THE MOST IMPORTANT FEATURE of the course was the guest lecture program. This gave the course a change of pace and introduced the concepts and thoughts of top management from the Chemical Corps, industry, and universities.

Speakers for this year's program were:

Colonel William J. Allen, Jr., Commanding Officer, Chemical Corps Engineering Command.

Colonel Frank M. Arthur, Chief Career Management Division, Office Chief Chemical Officer.

(Continued on page 34)

UNIT HISTORY AND THE HISTORIAN

By DALE BIRDSELL
Chemical Corps Historical Office

HISTORY is the selective re-creation of yesterday's experience. It is the historian's job to present that experience in as comprehensive and comprehensible style as possible. The historian's continuing responsibility is the preservation and integration of experiences. Considering the complexities and specialties of the modern Army, the military historian must demand a variety of information from his source materials in order to do his job. These materials must be sufficiently inclusive to permit the historian to understand the problems and some of the procedures within each variety of military specializations. They must be sufficiently detailed so that the historian can identify phases and results of operating experience, and they must be sufficiently numerous to allow cross-checking and comparative analysis among sources. Assessment and verification of historical sources, always an important task, has become a major factor in the historian's activity. For source assessment and verification he must first discover his own and his reader's needs.

As in the history of diplomacy, so in military history, every minute may have historical significance. In diplomatic history a word or gesture at the international conference table may turn the tide of events. In military history the course of battle may hinge on the firing of one shell, or the availability of one flamethrower. The problem becomes one of evaluating and judging each eventful minute so that a pattern of significance and timing emerges.

Confronted by the problem of judging and evaluating, the historian, military or diplomatic, finds that he must make the experience he studies his own. He must sit, at least in spirit, at the international conference table. He must be an impartial eyewitness to the placement of a mortar, the setting up of an ammunition dump, or the processing of a run of impregnated clothing. Only by becoming an eyewitness can he answer his reader's questions: Was the particular operation a success or a failure? Were our men equal to their task? Was policy sufficiently flexible and sufficiently firm to meet the situation? Did the equipment and weapons perform according to requirements? Was the process well planned and efficient? The answer to questions like these might furnish the clue to the success or failure of a mission, the death or survival of the participants, and the triumph or failure of some engineer or technician thousands of miles from the scene. But more importantly, in the answer to these questions may lie the key to success of future missions, the survival of soldiers not yet in uniform, or the germ of an idea for a new weapon.

HAVING thus determined the nature of basic questions to be kept in mind, the historian embarks upon concurrent programs of research and assessment and verification among many sources. He searches policy documents. He interviews participants in action. He reads the manuals, the orders, the directives, and the reports. He studies the maps, the charts, and the order of battle. But no other source is quite so satisfying to the curious military historian as the good unit history which has been written on the scene and which reflects or incorporates the best primary source, the unit journal or diary. No other source, except the unit journal, originates as close to the action, and no other source serves so well to make the historian a participant in that action. The good unit history tells of a policy so far as it is known, it cites orders and directives, it details plans, and it details operations step by step. It accounts for individuals by name. It discusses morale, equipment, organization, attachments and assignments. It comments upon terrain, weather, facilities, and channels of supply. It appraises action, and, most important of all, it details problems and accom-

DALE BIRDSELL

Mr. Birdsell, who has been with the Chemical Corps Historical Office since 1952, was a unit historian during World War II. He was born in Hillsboro, Oregon, and he received a B.A. from Reed College in Portland, Oregon. He received an M.A. from Brown University, Providence, Rhode Island, where he was also a teaching assistant, and is now a candidate for the Ph.D. at the University of Pennsylvania. In February 1956 Mr. Birdsell was awarded a Certificate of Achievement by the Commanding General, Army Chemical Center, for work in the location and designation of historical records important to the Chemical Corps.

plishments with comments on their significance. Of course, this paragon of unit histories does not exist, but the historian cherishes the hope that some day it might. Meanwhile he uncovers lodes of pure ore in unit histories which, although not perfect, are excellent sources of information from the vantage point of the direct participant in action.

A sampling of the historical file of the 81st Chemical Mortar Battalion, in the European Theater of Operations during World War II, demonstrates some of the salient features of good unit history. The history starts with the battalion alert just prior to "D-Day" in Normandy and it notes how unit personnel and vehicles were moved into the marshaling area, appointed to craft, and embarked. The action on the far shore, in which the battalion commander, Lt. Col. Thomas H. James, was seriously wounded, is detailed. The condition of weapons, vehicles and equipment is set forth and channels of resupply are discussed. The mission is stated. Attachments are listed. Targets are spotted, as are mortar positions, by map coordinates, and rounds expended are enumerated by type and by target. Casualties and decorations are listed. This account is continued for combat all the way across France. The most descriptive part of the story is in the daily company diaries which appear as enclosures to a report-letter originating with the battalion commander.

The form of the report of the 87th Chemical Mortar Battalion, commanded by Lt. Col. James H. Batte, is that of a summarized daily battalion journal presented as an inclosure to a brief letter listing attachments, personnel and casualty statistics, awards, citations and commendations, and ammunition expenditures. Comparison to the report of the 81st battalion is interesting since both battalions were "beachhead units," operating in the same area and subject to the same reporting regulations. The same type of information appears in both reports, but in a slightly more detailed form in the report of the 81st. Both are good reports, but the historian would probably show a preference for the more complete one which reports from company level. Despite preference, the historian has had a field day with both reports. The logistic historian has a record of movement, of expenditures, and of resupply. The combat historian has a record of action, or individual and unit performance, of weapons function, and of support furnished. If there were an enlarged account of policy, more continuity within the operations accounts and a greater connection of these accounts with the pre-combat activities, the reports of the 81st and 87th Mortar Battalions would be the sought for paragons of reports.

Turning from combat support, to service support, the military historian again finds unit historical reports of great value. Indeed, since the American genius for invention and improvisation is widely applied in supply, service, and maintenance operations, it is frequently impossible to tell how a particular service support job was done without an account from the operating unit. In the service support field, however, good unit histories are harder to find. Every man in combat is his own historian since every moment of a combat situation is an important one to the soldier involved and to the historian who tries to relive his experience. The service unit soldier judges his contribution with greater difficulty. What may seem to be a routine job in his eyes may actually be a matter of prime interest to the historian of logistics. The historian may find his most crucial task to be the reconstruction of a routine service process which the soldier dismissed as something "everybody knows".

For example, it seems that everyone who mixed flamethrower fuels during World War II evolved his own methods and his own proportions of napalm to gasoline. These variations in process would have been unimportant if the product had been uniformly acceptable, but the misfiring of flamethrowers in combat led to considerable concern throughout the war over the processes of mixing and the condition of the napalm and gasoline mixed. Investigations were made but no definitive answer was given to the question, "How was the job done?" The problem is now the historian's. Interviews have been helpful, but individual experience is too restricted, or the authorities disagree, or memory dims with the passage of years. The answer would lie in a compilation of techniques, equipment, and results of fuel mixing by service units. Many service units, however, report only "mixed flamethrower fuels" without any explanation of process, problems, or solutions. Although Major Robert T. Hart's 43d Chemical Laboratory, stationed in Hawaii, included in its historical file a comprehensive report of experiments and experiences with flamethrower fuel mixing, it seems probable that no definitive compilation of data will ever be possible.

The history of the 43rd Chemical Laboratory is typical of many World War II service unit histories. That part of the file specifically labelled "history" is nothing more than a listing of station and personnel changes interspersed with a few sentences on training and recreation. It answers few questions. Fortunately the same unit historical file contains a number of excellent technical reports and summaries which detail the work of the unit. Such historical reporting by inclosure is entirely acceptable to the historian, particularly if the inclosures are connected by some sort of narrative, chronological framework. The inclosures themselves are basic source materials, and they are frequently all the more valuable because they were selected as illustrative of a particular problem or event.

Some chemical service units in World War II had a flair for recording important events and problems in a good narrative style. One such unit was the 101st

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Chemical Processing Company, commanded in turn by Captains Earl B. Scott and Nathaniel S. Colley. While stationed on the Russell Islands in the Pacific, the unit, in less than four months' time, processed more than 80,000 complete protective uniforms for the Marine Corps and did a quantity of testing and reimpregnating for the Army. The history of this unit includes accounts of the condition of processing equipment on arrival, the siting and layout of the plant, the provision of water, the status of supply, the difficulties with processing solutions, expedients for safety, and personnel and production problems. This account presents, in brief compass, almost every operating detail concerning primary mission which the historian might desire. The historian would welcome, nevertheless, information outside the primary mission.

With respect to details on all phases of unit activity, the history of the 102nd Chemical Processing Company is outstanding. Here there is not only information on primary mission, but also material on training, associated and unassociated secondary missions, housing, recreation, and personnel. This company was activated at Edgewood and trained at Edgewood and at Camp Sibert, Alabama. It boarded ship, the Lucretia Mott, at Newport News at 1240, 23 October 1943. On 11 November the Lucretia Mott passed the Rock of Gibraltar, and on the thirteenth the unit landed in Oran, Algeria. After a ten-week stay in Africa, the 102nd Processing Company was again on the move, this time on the Dutch ship, Johann de Witt. On the thirteenth of February 1944, the unit landed in Bombay, India. Then for nearly two years the men of the 102nd processed protective uniforms, impregnated clothing with insecticides, did dry cleaning and construction work, furnished drivers for the Ledo Road, operated a PX, and performed numerous other services. This sort of information, some of no apparent significance, has proved to be a boon to the historian.

The Chemical Corps historian has the additional duty of answering requests for information on a variety of subjects for Chemical Corps personnel and other Departments of Defense agencies. "Spot" or topical informal histories are sometimes requested on such matters as morale, living conditions, non-battle casualties, and even individual accomplishments. "Fringe" information on secondary and even unrelated missions of service units has helped to answer many direct questions. But fringe information is not used only in answering requests. Fringe information permits a more realistic reconstruction of the whole experience and thus improves formal accounts and official histories.

THE citation of examples of unit histories in Chemical Corps files could go on through smoke generator, service, maintenance, decontamination and depot units. Further citation, however, would only emphasize the point that there are certain characteristics of good unit history useful to the historian. One of these characteristics is the citation of authority for every action, and the citation is enhanced in value if policy and mission assignments are described. Another characteristic is the reporting of routine or common operations with comments on personnel, equipment, techniques and problems. The most important characteristic is a full discussion of major operating events, problems and accomplishments. The best reports include names, dates, phases of operations, plans and results. The historian has found that too much is better than too little where unit history is concerned. These are the characteristics relating to subject matter—as important are the characteristics relating to tone and style. The most helpful reporting style is narrative but not chatty. The tone is informal rather than official, and it allows the discussion of relationships with superiors, subordinates and equals without complaint or rancor. The two questions most frequently asked are: first, "Why?", and second, "How?". An objective, judicious tone helps most to provide the answers in a comprehensible form.

Today our lives are too complicated and too specialized for any single individual to gain a very wide experience outside his own particular field. Yet, precisely because of the complications and specializations, the individual needs a wide experience and a broad view in order to cope with the multifarious problems of modern living. The historian attempts to fill this need by providing a vicarious wide experience for his reader. He also tries to lay the foundations for a broad view. It is not the historian's responsibility to forecast or to evolve policy and doctrine; that is the province of others. It is his responsibility to collect and integrate experiences, to judge and evaluate policy and performance. The historian's judgments and evaluations are dependent upon his assessment and verification of his source materials. His work is only as valid as his sources. The use of unit histories proves that good sources permit one man to have the experience of thousands. It is the historian's belief that experience in the form of good source material invested with him can be returned at a good rate of accrued interest to the investor and his heirs.

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FOOD MCHY. & CHEM. CORP.

(Continued from page 15)

tirely different process for making soda ash built by a major producer in more than half a century.

Westvaco Chlor-Alkali makes some of the best known and widely used chemicals in the world today. Chlorine, caustic soda and caustic potash from South Charleston are essential ingredients in making rayon, soap, paper, glass, chemicals, textiles, rubber and petroleum products. Soda ash from Westvaco, Wyoming, is used in great quantities in the making of refined metals, sugar, glass, soap, aluminum, pulp and paper and petroleum. Westvaco chlorine has many uses, in bleaching and water treatment and in the making of thousands of everyday products from insecticides to adhesives. Solvents from Westvaco Chlor-Alkali are used in dry-cleaning, in fire extinguishers, in grain fumigants and fluorinated hydrocarbons.

Westvaco Chlor-Alkali also makes some less familiar chemicals. The Division was the country's first major commercial producer of unsymmetrical Dimethyl Hydrazine (UDMH), a fuel component in rockets. Diisocyanates, used in the manufacture of plastic materials which can be formulated as rigid honeycombs or sponge-like cushions, and which have many uses as lightweight but strong structural materials, have also been under investigation at Chlor-Alkali.

Much of Westvaco's chlorine is sold in gaseous or liquid form while the remainder goes into the making of chlorinated solvents (like carbon tetrachloride) and various chlorine-containing organic chemicals. In 1944, Westvaco built a plant at South Charleston for the large-scale production of chloral, vitally needed for making DDT. By 1947, Westvaco was making millions of pounds of DDT annually from its own chloral. In the FMC Chemical family, Niagara now makes both chloral and DDT, while the chloral intermediate is still made at South Charleston. Commercial production of another important insecticide, BHC (Benzene Hexachloride) was also begun by Chlor-Alkali following World War II. By-product hydrogen once burned as a fuel, is now converted to ammonia.

Another product of the brine wells is bromine. Liquid bromine is sold to the chemical industry and Westvaco Chlor-Alkali also makes ethylene dibromide (used as a soil fumigant, and as an ingredient of the Division's line of grain fumigants). Hydrogen bromide (also made at South Charleston) is used as a reagent in making pharmaceuticals, vitamins and fine chemicals.

Carbon bisulfide, an important industrial chemical, solvent and fumigant, has long been a product of the South Charleston plant. The Division now has a large continuous installation on stream, a plant employing a new patented process, which gives an exceptionally high purity product. One-sixth of the country's total needs of carbon bisulfide are currently supplied by this plant.

At Chlor-Alkali's soda ash operation at Westvaco, Wyoming, the raw materials for the process are literally under foot, just as with the South Charleston brine wells. Fifteen hundred feet below the ground lies an extensive bed of trona, which on processing, yields the remarkably pure superior soda ash that Westvaco Chlor-Alkali markets.

EARLY EMPHASIS ON new chemicals in the Chlor-Alkali Division was on chlorinated and brominated materials, in which the plant's own raw materials could be used. For instance, thiophosphoryl chloride, an oil additive and insecticide ingredient, was originally a development product, though it is now made in commercial quantities.

Ohio-Apex Division—Headquarters Nitro, West Virginia

The race for leadership in rocket engineering led Westvaco Chlor-Alkali into the production of UDMH. Within six weeks of hearing of the need for this material, Westvaco was producing drum quantities of UDMH at South Charleston. UDMH has important characteristics that make it suitable for such rocket uses, and in addition Westvaco Chlor-Alkali foresees uses of UDMH as a potential ingredient in making pharmaceuticals, plastics, rubber, and agricultural chemicals.

Ohio-Apex Division

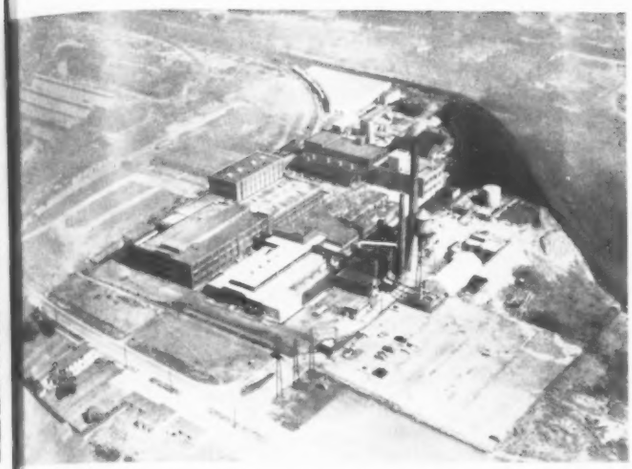
Ohio-Apex is primarily a producer of plasticizers, though it got its start outside of the plastics industry. Organized in 1929 as Kavalco Products Inc., the firm began to produce mainly pharmaceuticals at Nitro, West Virginia. Its present name stems from a period when the firm existed as an Ohio corporation, known first as Apex Chemical Company and later called Ohio-Apex, Inc. In 1936, the corporation was reformed under West Virginia law, but the name Ohio-Apex was retained. In April 1951, Ohio-Apex became a Division of FMC.

Many interesting new products have been developed at Ohio-Apex, both before and after it joined the FMC family. The company has pioneered processes for the manufacture of high-purity anhydrous aluminum chloride and today is the sole commercial producer of a white product of very low iron or copper content. Ohio-Apex also pioneered the commercial manufacture of di-2-ethylhexyl phthalate (DOP), one of the most important plasticizers, and diallyl phthalate.

During World War II practically the whole production of Ohio-Apex went for essential military and civilian purposes, for which it was awarded four Army-Navy "E" citations. Today Ohio-Apex is one of the largest chemical manufacturers in the world specializing primarily in plasticizers.

Plasticizers, Ohio-Apex most important products, had their beginnings in 1868, when John Wesley Hyatt "plasticized" nitrocellulose with camphor to make celluloid as a substitute for natural ivory. Camphor did not reduce the flammability of the nitrocellulose, nor did its plasticizing effect last long. Manufacturers, seeking a new plasticizer, produced tricresyl phosphate. The first synthetic plasticizer and still widely used, tricresyl phosphate not only reduced the flammability of celluloid but prolonged its life indefinitely.

After World War I lacquers were developed to use up surplus supplies of nitrocellulose that had been produced for explosives. Extensive marketing efforts es-



Becco Chemical Division—Headquarters Buffalo, New York

Fairfield Chemical Division—Headquarters Baltimore, Maryland

tablished nitrocellulose lacquers as finishes for practically all automobiles and appliances as well as a large portion of the production of machinery and furniture.

These lacquers, plasticized with tricresyl phosphate, provided a long lasting finish. It soon became apparent, however, that articles finished in white or light colors would darken or yellow after exposure to sunlight. Another plasticizer, dibutyl phthalate, was used to overcome this disadvantage, but was not permanent, causing the lacquer to crack and peel. Intense research was directed toward producing better plasticizers.

Ohio-Apex, pioneering in this effort, in 1935 made Kronisol (dibutoxyethyl phthalate) the first non-yellowing plasticizer for nitrocellulose lacquers which was sufficiently non-volatile to make permanent films.

LATER, in 1938, DOP (dioctyl phthalate) was developed at Ohio-Apex for vinyl resin plasticization, where it proved over the years to be the giant of the plasticizer business. The discovery that vinyls could be plasticized to varying degrees of elasticity over the whole range from semi-rigid to rubbery opened an entirely new field of manufacture, and DOP contributed greatly to the rapid growth of the vinyl plastics field. Ohio-Apex was the sole manufacturer of this important plasticizer until 1942. Vinyl plastics are extruded, molded, cast, milled or calendered into thousands of useful goods, replacing old materials and leading to products never seen before. The vinyls manufacturer at the early part of World War II employed three principal substances: vinyl resin, DOP and tricresyl phosphate. To these materials stabilizers and colors were added.

In general most early requirements of plasticized vinyl plastics were successfully met by formulations containing only these two plasticizers. However, the rapid expansion of the use of vinyl compounds and their entry into many new and complex uses created situations where specific characteristics were required. Special properties, such as light and heat stability, low temperature flexibility, oil resistance, good electrical properties, etc., had to be developed. Better workability to permit increased production became important as the industry grew. Through many years of research the Ohio-Apex Division has developed the most complete line of plasticizers offered by any one manufacturer.

Plasticizers are the major portion of Ohio-Apex's present business. Its specialty chemicals, anhydrous aluminum chloride being the most important, make up the rest. There is something new in the picture, however. Ohio-Apex has entered the field of resin manufacture with a new patented material called DAPON Resin, which is a dry powder prepolymer of diallyl phthalate. This new free flowing resin has many advantages over earlier material marketed in solution form in which solvents were present.

The present important uses of DAPON resin are as the principal component of molding powders for the manufacture of electrical parts and as the resin in laminates used for the manufacture of aircraft structural or electrical parts such as radomes. Such uses point up the excellent electrical properties of DAPON resin as well as its mechanical strength and resistance to moisture or chemicals. The dimensional stability of parts made from DAPON resin and the freedom from shrinkage during and after cure are outstanding properties which help in the precision molding of various electrical products, many of which are covered by military specifications.

We expect to see this promising new material, now in full scale production, find many new uses as time goes on, both as a laminating material with paper, glass, cotton or synthetic fibers and as the essential thermosetting ingredient of general purpose molding powders.

Becco Chemical Division

The chemical most prominently identified with FMC's Becco Chemical Division is hydrogen peroxide. The use of dilute solutions of peroxide as a household disinfectant and germicide and as a hair bleach, are well known. However, largescale bleaching, particularly of textiles and paper pulp, is the largest application of hydrogen peroxide and it has many other varied industrial uses.

The active oxygen contained in hydrogen peroxide has military importance too. One gallon of ninety per cent peroxide can yield about five thousand gallons of steam and oxygen at a calculated temperature of 1,400 degree Fahrenheit. Using a suitable reactor to decompose the peroxide, the jet action of the hot exhaust gases readily furnishes the power to launch or propel a plane or a missile or drive a pump.

From its founding in 1926, Becco has been in the forefront of the development of new uses for hydrogen peroxide and the family of active oxygen chemicals based on it. These active oxygen products are now bulk chemicals of major importance.

Becco's main plant is at Buffalo, New York, and a second plant was built in 1952 at Vancouver, Washington. The Division also maintains supply points for hydrogen peroxide and other peroxygen chemicals in seven other cities.

BECCO WAS THE FIRST producer of electrolytic hydrogen peroxide in this country. Although basic manufacturing principles have changed but little over the years, production capacity has risen to very high levels. Improvements in peroxide technology are apparent from the range of concentrations now available. In 1930 the standard concentration was 27.5 per cent. Today most of Becco's deliveries are either 35 or 50 per cent and both 90 per cent and virtually 100 per cent peroxide are readily available in commercial quantities.

One of the early problems of the industry was storage stability. Hydrogen peroxide solutions breakdown to water and oxygen is accelerated by contact with certain metallic impurities. For this reason, peroxide was originally shipped entirely in glass containers. In 1931 Becco pioneered in using aluminum tank cars for shipping concentrated peroxide, and a little later aluminum drums for peroxide were also developed. Becco engineers have also designed aluminum storage tanks for customers. The peroxide industry could not have reached its present stature and price level without these bulk shipping and handling procedures.

Other peroxygen compounds made by Becco include various persulfates, which are well established in polymerization techniques for the making of synthetic rubber. Peracetic acid is an important oxidizing agent used in making a number of important insecticides and other synthetic organic chemicals. Becco's sodium perborate is used in the textile industry in developing dyes and is also an important ingredient of powder bleaches for domestic laundry use. Calcium peroxide goes to the pharmaceutical industry and is a dough conditioning agent.

Many of the present uses for peroxygen chemicals were developed directly by our research and development staffs at Becco. In addition to the design of specialized equipment to produce all of Becco's products, Becco engineers have designed and installed elaborate bleaching equipment for the paper and textile industries. A special project group has been engaged for some time in classified research for the government.

Becco is now undergoing a multimillion dollar expansion at both its Buffalo and Vancouver facilities. The Vancouver plant, currently the world's most modern and efficient facility for the electrolytic production of hydrogen peroxide, is being greatly enlarged.

At Buffalo, expansion plans are in essence a continuation of Becco's research on methods of making hydrogen peroxide of higher quality at lower cost. Over a fifteen year period, we have perfected a low cost non-electrolytic process which would not be limited by the availability of electric power or of certain vital materials of construction. A new non-electrolytic unit was placed in operation for the first time within the past year.

We believe that the consumption of hydrogen peroxide will continue to increase, and consequently we expect to continue expansion of our production facilities. We also intend to broaden our peroxygen operations through new products and applications thereof to take the fullest possible advantage of Becco's basic position in this important field.

Fairfield Chemical Division

In 1954, FMC completed negotiations for the purchase of National Distillers Products Corporation's USI Fairfield, Maryland, plant at Baltimore. The plant included substantial production facilities for some important organic chemicals—among them the pesticides pyrethrum, allethrin and piperonyl butoxide.

The first buildings at Fairfield were erected in 1915 by the Curtis Bay Chemical Company, formed jointly by U. S. Industrial Alcohol Company and Hercules Powder Company, to provide the British with acetone for the manufacture of munitions. U. S. Industrial Alcohol shortly afterwards obtained complete ownership of a new corporation, U. S. Industrial Chemical Company, Inc., and assumed operation of the plant. During the period between World War I and World War II facilities were expanded to produce a greater variety of acetic esters and other chemicals.

Fairfield's activity in chemicals for the pesticide industry was started within the organization of Dodge and Olcott, Inc., in 1939. After the acquisition of D & O by USI an entomological laboratory was added to Fairfield's research facilities and production units for the pesticide chemicals were moved there from D & O's Bayonne, New Jersey, plant.

In the two-year period under the ownership of National Distillers, Fairfield had its first contacts with FMC. Meta-chloranilin supplied by Westvaco was processed there into a chloro IPC concentrate and shipped to Niagara's Pine Bluff plant where it was mixed with solvents to make the finished Niagara herbicide product.

FAIRFIELD'S PYRETHRUM and piperonyl butoxide are sold in combinations of many different ratios under the well-established registered trade name of Pyrenone. Allethrin is a synthetic compound chemically related to natural pyrethrum. These chemicals have a unique quick-killing effect on insects. They are compatible with most insecticide formulations and are used in a wide variety of sprays, dusts, dips, wettable powders and aerosol bombs.

Pyrethrum is a flower, a member of the chrysanthemum family, which generally can be grown on a commercial scale only at high altitudes near the equator. Dried pyrethrum blossoms contain by weight about 1.0 to 1.7 per cent of the effective insecticide, called pyrethrins. Somewhat less than this amount is recovered in large scale production. Usefulness of pyrethrum was greatly limited until recently by its cost, the uncertainties of transporting it great distances and the instability of pyrethrum on exposure to light and air.

Research efforts to find a synthetic pyrethrum or a synergist that would reduce its cost were redoubled in World War II. Japan was then a major source of pyrethrum and German U boats made African supplies doubtful. The government commandeered available stocks for military use in newly developed aerosol bombs and Fairfield provided a major portion of the pyrethrum that played so important a part in the added war against insects in the malarial jungles of the South Pacific.

Finally, in 1946 Fairfield developed the synergist piperonyl butoxide and the possible applications of pyrethrum were extensively broadened. Piperonyl butoxide was found to increase the effectiveness of pyrethrum 16 times. Furthermore, it also is non-hazardous and the two in combination possess a high degree of stability.

In 1949, the U. S. Department of Agriculture announced the successful synthesis of one of the constituents of pyrethrum, which became known as allethrin. At Fairfield this knowledge was translated into the first fully-integrated plant to make allethrin. One of the most complicated organic chemicals thus far attempted on a commercial scale, the process involves 18 basic steps and 200 pounds of material to produce one pound of allethrin with a purity of not less than 90 per cent. Fairfield now has the safeguard of allethrin plus piperonyl butoxide, the most effective synergist available to extend the activity and lower the cost of both.

Important as its role in pesticide chemicals is and may become, Fairfield's stature in the broader fields of organic chemicals is growing rapidly, and promises to be of great

importance in the future. Dyestuff intermediates, pharmaceutical intermediates and many other chemicals, particularly those related to phosgene chemistry, are already in volume production at Fairfield.

Central Chemical Research

As a central focal point for our varied long range chemical research activities, we have just completed a Central Research Laboratory at Princeton, N. J. In these new facilities, upwards of one hundred and fifty of our top technical people will concentrate on long-range research in such fields as polymers, special organic compounds, tracer applications and plastics. Investigations will also be made in various high-temperature and high-pressure manufacturing processes, and generally in fields not immediately related to our present production. Petro-Tex will use part of the new research center for work on petrochemicals.

Strong in our present position in relation to established chemicals, and yet keenly alert to the chemicals of the future that research will uncover, we in the Chemical Divisions of FMC look forward with confidence to the future. The added impetus of our new research center promises an even greater rate of growth and broader diversity for FMC in the chemical world in the years ahead.

DR. LIBBY

(Continued from page 11)

Finally, of all the chemical problems associated with Atomic Power perhaps the most immediate and pressing is the cheap processing of irradiated fuel elements from the many types of heterogeneous reactors now under construction. For immediacy and quick bearing on the cost of Atomic Power it outranks the other atomic power jobs the chemist has to do. We have in a certain definite sense committed ourselves to a program which assumes that this job will be well done. I am certain that this will prove to have been sound planning, but there nevertheless is a very real need to interest the chemical fraternity in this task in order that it will be done.

Although the solution of these difficult problems is only a matter of time, the method of solving them quickly is to encourage good men to work at them, and now the principal difficulty appears. There is such a shortage, relatively speaking, of the highly skilled and gifted chemists and engineers who are needed to solve such problems as the corrosion of particular types of homogeneous reactors that the solution of these problems is being seriously delayed because not enough gifted people are available to work on them. The Atomic Energy Commission hopes that the Atomic Power Program can move forward with all possible speed short of interfering with the armament of our country. It is our wish, therefore, that the chemical industry interest itself in the problems of Atomic Power, for most of the chemists not now working on atomic energy are in the employ of industry. Of course, a great deal can be done by closer liaison with these universities surrounding the various reactor development laboratories such as the Argonne National Laboratory. The chemists teaching and doing research at the universities can undoubtedly contribute in the solution to the reactor development problems if the problems can be explained to them and their interest excited. These are the two sources of chemical manpower that have not yet been tapped for atomic power—the chemical industry and the university faculties. We

(Continued on page 26)

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want both. . . . We understand well the reasons why it has not happened in the past, but the understanding does not lead to a feeling of happiness that it has occurred. Considering the shortage of highly skilled technical manpower, it might even be considered a mistake to divert chemists to any great degree from the important work they do in the chemical industry now. However, it seems clear to me that we should be able to have the new miracle drugs, the new synthetics, etc., and have atomic power also. Let us try to do this. Let us try and have everything. Let us try and lead the world in the development of the Peaceful Uses of the atom without hampering our other technological developments. Let us try this. It can be done if we all try.

The chemists have to learn about atomic energy in order to have this happen, and I am most happy to have the opportunity to speak to you this evening and contribute in some small way to the effort to interest the chemical fraternity in the problems of the development of atomic power. We need your interest greatly, because we need your skills and ability to solve the problems which have thwarted our chances in certain critical areas, particularly in homogeneous reactors and the utilization of the product plutonium.

3. Isotopes.

We have a Peaceful Use already in being which next to the first of the Peaceful Uses, peace itself, is rewarding us bountifully for our investment and interest in atomic energy. This use is Isotopes. Isotopes is the utilization of radioactive elements to label compounds and materials so as to understand the mechanism of chemical reactions, the numbers of masses of materials, and for various analytical purposes by the dilution technique. Thousands of applications have now been made to research in the physical and biological sciences, but tonight I speak more particularly of the application to industrial processing. Dr. Donald E. Hull of the California Research Corporation was in many respects a pioneer in the application of isotopes to the testing of lubricants and fuels for the Standard Oil Company of California. He also developed the usefulness of radioactive tracers for plugs of liquid fuel pipelines so that their diversion at a particular valve point could be done more accurately at very considerable savings of valuable crude and other materials. In addition, a method of measuring the circulation rate for a fluidized catalyst bed was developed by him and his associates. There are several people like Dr. Hull in this country developing these uses and daily new ones appear. We estimate that during the present year over 100 and possibly 200 million dollars were saved in industrial processing costs by the use of isotopes for control methods. It seems very likely that within five years this will exceed one billion dollars. There was an article the other day by M. E. Merchant (Nucleonics, Vol. 14, No. 5, May, 1956) in which it was claimed that the use of isotopes may well save 10 percent of the total machining costs in the United States. This exceeds one billion dollars per year in itself if it should prove to be true. We can see how the further development of the use of isotopes in industry will make these preliminary figures small.

It is nearly true that every material of nature, everything we know, everything with which we deal in everyday life, can be made radioactive in a safe but easily measurable manner. This is the concept of Everyday Use of Isotopes in "exempt quantities," useful but harmless amounts. Perhaps this in itself may prove to be just as important a Peaceful Use as Atomic Power. In any case, there is no conflict between Isotopes and Atomic Power except possibly in the interests of the people developing it. However, they are so far different it seems not unlikely that the people interested in the development of Peaceful Uses for Isotopes may not be the ones who would otherwise develop Atomic Power—or it may be that the development of the Peaceful Uses of Isotopes may supplement and interest people in atomic energy in general and so get them to look at Atomic Power. In any case, the conflict seems not to be very serious. But the Everyday Use of Isotopes in the control of industrial processes is a blessing to us and the world as a whole which the atom has brought and from which we will probably receive good dividends in our entire atomic investment in the Atomic Energy Commission program.

In addition, we have the benefits of the use of Isotopes in agriculture and in basic fundamental science and, as we all know, the discovery of the new laws of nature is one of the most lucrative and profitable occupations any man can undertake, provided he is patient and far sighted enough to await the natural developments of the new knowledge.

Our children and grandchildren shall without doubt praise us for the development of atomic energy for its Peaceful Uses. With no doubt there will be new uses made of which we have not dreamed, but among the important Peaceful Uses throughout all time will be Isotopes. The chemist remains the principal applier of Isotopes, the inventor of new uses, and the principal developer of ramifications as yet not named. We can imagine the chemists will continue to play this role, so once again I say, your role in atomic energy is of extreme importance. Please think when you do your everyday work how you could do it better with Isotopes. All the materials with which you work can be made radioactive.

It is possible to measure in a reliable, easy manner the total number of radioactive atoms in a given sample of matter. Thus reagents which have a given specific activity, say of radioactive chlorine, can be measured out by volume into a solution of unknown chloride content, silver nitrate added, and a precipitate produced and the absolute concentration of radiochlorine in the resultant precipitate determined. The dilution caused by the unknown amount of chloride gives an immediate analysis for chloride in the solution. True these measurements to date are only accurate to about 5 percent, but they are so fast and so simple that I think one can say that for the chemical isotopes—hydrogen, carbon, sulfur, phosphorus, chlorine, calcium, etc., we have a technique which may liberate us from many of the difficulties in the laboratory. We should by all means introduce these techniques into the present chemistry courses in the universities and high schools so the students will have this additional peep-hole to look into nature and see how she works. It is not that we want to teach radiochemistry particularly, but through use of these techniques the students will be taught ordinary chemistry better and will develop, I hope, an incidental interest in atomic energy and the Peaceful Uses of the atom.

H. A. KUHN

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THE CONFERENCE—

BOON OR BUST?

By ALFRED C. BENSON

★ **Why are conferences on the increase?**
★ **Why are they so often ineffective?**
★ **What can be done about it?**
★ **What are some of the rules of good procedure?**

"We waste more dammed time at conferences". How often have you heard this remark as you filed groggily out of a smoke-filled conference room?

"It seems I spend my whole day at conferences. The only time I get any work done is after hours and on Saturday". How about this one—sound familiar too?

Conferences are on the increase. The facts are that all manner of devices and equipment, and the procedures that produce them, are becoming more and more complex. This complexity results in the incorporation of different skills which in themselves are growing to the extent of requiring the services of specialists for proper coverage. Whenever several people become involved on one project it becomes necessary for them to confer together—thus we have conferences.

It is quite clear just what a conference is and why they are convened; however, since this article will analyze "the conference" to determine the reasons for its unpopularity and will suggest corrective action based upon an understanding of these reasons, it might be well to set down a more detailed definition.

A conference is a meeting of two or more persons called for the purpose of discussing a *common* problem on which *each* of the participants is *qualified* to have an opinion. To be effective the conferees should collectively possess the talents and authorities required to fulfill the purpose of the conference. Conferences are generally called for developing policy, reconciling conflicting views or interests, solving operational problems, reviewing progress, educational purposes, etc.

Why are conferences unpopular?

We have defined a conference; discussed how they come about; established the probability of their continuance; so now to round out the picture, let's set forth some experiences that have made them unpopular. The following comments describe some of the conferences most of us have attended and wish we hadn't.

The Blind Date

You don't know what it is all about beforehand so you are either unprepared or bored by items of little interest to you.

The Bull Session

No results are reached. A lot of subjects are discussed. Everyone catches up on local gossip. No one is sure of status at completion of session; and often, confusion replaces what originally was just lack of knowledge.

The Dry Run

Some seeming results are reached but nothing further is ever heard on the subject after the meeting breaks up.

The Sleeper

Some results are agreed upon but after the meeting, differences of opinion arise over just what was agreed on. This is a good method of starting long term feuds.

The Time Waster

The discussion strays off the subject more than 50% of the time. The issues involved could be settled in one-tenth of the time by a few key people.

The Captive Audience

There's always one in the crowd that loves to talk. "Nice guy but how many times must he be allowed to make the same point?"

The Bully's Battlefield

Dominated by the sadist who delights in cutting people to ribbons before an audience. The conference provides this mal-adjusted troublemaker with a battlefield.

The Political Arena

The habitat of the smooth operator who is the more dangerous of the breed. He will very innocently expose the weaknesses of his potential rivals—particularly if a boss is present.

What are the redeeming features?

At this point you probably feel that "the conference" is an infernal device that should be banned as subversive. Before we pass judgement, however, let us establish those benefits that theoretically should be possible to be derived from the conference method. In this way we can decide whether the subject is worth further analysis. A description of some of these benefits are as follows:

Reduced Errors

Problems requiring decisions generally have many sides all of which must be adequately considered to insure effective solutions. Since the present trend is toward greater complexity and specializations the efforts of one man on a problem tends to illuminate only one side of a problem adequately. By improving the competence of this individual greater light

will be thrown on the side of his specialty but the other sides will still be left in darkness. Effective solutions require the combined efforts of specialists selected to illuminate *all* sides of the problem– the conference method reduces the tendency to slight one or more sides of a problem.

A Time Saver

By the conference method all aspects of the problem can be considered at one session with all conferees gaining the benefit of each other's viewpoint. This eliminates the need of revising decisions which might have otherwise been based upon incomplete information.

Psychological Advantages

The emotions have a powerful effect on mental activity. In the case of conferences, group participation tends to increase enthusiasm and foster a natural competitive spirit — thus stimulating the flow of ideas.

Improved Morale

Properly used, conferences can result in decisions that represent the combined effort of all conferees. As a result such decisions are more likely to be honestly supported by the conferees since they had a hand in their making.

Superior Decisions

Studies on thinking have demonstrated the value of experience. Practically everything devised is based upon the adaptation of existing knowledge. Thus in a conference the experience available for accomplishing the purpose is represented by the total of that of all conferees. Also since much progress is the result of the adaptation by one industry or profession of the developments of others, each member can draw on his own peculiar experience for suggested solutions to problems presented by the others. For example the making of continuous glass sheet was suggested by the experience of the steel industry.

Let's check the score.

It would be foolhardy to minimize the drawbacks of the conference method; however, the potential advantages are substantial and if the drawbacks can be eliminated, or at least minimized, the gains would certainly be worth the effort. In any case, since the conference method seems to flourish despite its drawbacks, any improvements devised will be of lasting benefit.

A logical point to tackle the problem is by analyzing the drawbacks. It is interesting to note that the seven difficulties cited above are caused by three failings in conference technique.

The "Blind Date" and the "Bull Session" are caused mainly by a lack of preparation for the conference.

The "Dry Run" and the "Sleeper" are caused by a lack of written policy on the use of the conference method.

The "Captive Audience", the "Bully's Battlefield", and the "Political Arena" are caused by an ineffective conference leader and by faulty human relations on the part of some conferees.

Thus by preparing for the conference in advance, by selecting the proper conferees, by having a strong conference leader able to cope with bad actors and keep the discussion on the topic, by recording results, and by conducting an adequate follow-up, these defects can be eliminated.

How do you do this?

To accomplish the results inherent in the conference method, managament must first take the following action:

Provide Recognition

Management must recognize that the conference technique is a tool that cannot be used without adequate training. The art of running a conference must be given status just as any other skill such as designing, cost accounting, production scheduling, etc. Men who run conferences are often selected for their technical ability; however, the conference leader's chief job is to handle human material and as such it is essential that he understand human nature and be skilled in directing the efforts of several persons to accomplish a specific aim.

Install Training Program

Those personnel who have need to use the conference tool must acquire, and learn to apply, the principles of conducting or taking part in conferences. This training can best be imparted through a training program (A good conference text is "Standard Business Conference Technique" by Carl Heyel, H. Wolff, New York, New York, 1948).

Establish Policy and Establish Procedure

Directives governing the calling and conducting of conferences must be established and distributed to all personnel who will be required to attend conferences. Any operation to run smooth must have a set of "rules" to play the game by. These "rules" must be adequate, intelligent, and fair.

Delegation of Authority

Finally management must delegate sufficient authority to the conference leader to insure the cooperation of all conferees during the conference.

Guide lines for conferences follow.

To round out this article a few guide lines for conducting efficient conferences will be included. These will be provided under the general headings of Preparation, Conducting the Conference, Record Keeping, and Follow-up.

Preparation

This is probably the most important phase of the technique since it constitutes the foundation for what takes place later. Thorough planning can get the conference off to a good start and substantially reduce its length. Preparation generally includes the following steps:

(1) Definition of purpose and establishment of agenda.

(2) Selection of conferees and establishment of time and place for meeting— (The conference leader should have the respect of the other conferees, be able to keep the discussion on the subject, be able to avoid personality clashes, and have a sense of humor. He should know when to table fruitless discussion, and how to sum up agreements when reached.

The conferees must be selected to provide a qualified opinion on each phase of the subject under discussion. In addition each conferee should have the authority to act for the organization he represents.

The time and place for meeting should represent the best compromise of the desires of all conferees.)

(3) Notification of Conferees—(The notification of the meeting should be in writing and should include the definition of purpose, the agenda, and the time and place. The notification should be distributed to each conferee as early as possible to permit adequate preparation.)

Conduct of Conference

The order established on the agenda should be adhered to as close as possible.

Each item should be discussed until an agreement is reached. This agreement should be summarized by the conference leader and read to the group for approval. Items that cannot be resolved should be tabled after the establishment of a program to eliminate the difficulties.

Records

A written record should be made of all the decisions and important points covered at the meeting. A copy of this record should be supplied to all conferees.

Follow-up

Arrangements should be made for following-up all agreements reached at conferences to insure that they are put into effect. Nothing will kill off interest in conferences more inexorably than a failure to make use of its results.

Let's check our perspective.

At this point you might observe, "All of this planning and preparation makes sense for the high level conference—but how many of these do we have? And don't these conferences go over pretty well?"

This is all very true; however, high level conferences are not called on the spur of the moment and when they are called they generally discuss problems that have been brewing for sometime—thus adequate preparation has generally been accomplished although it might have been accomplished informally. Also high level conferences run smoothly because of the high caliber of the personnel attending these conferences.

"Agreed" you might say, "but we are also discussing conferences of a lower level and the administrative time required to set them up as suggested would eat us out of house and home. Also *time* is often a critical factor and the delay occasioned by the planning and preparation might cause additional problems."

This comment leads us to the nub of the problem—the proper recognition of the place of "the conference method" in modern business.

Individuals at times are like parts of a machine and just as cylinders, pistons, valves, etc., do not make an engine until their operations are synchronized; so individuals, until their efforts are synchronized, do not make a business. And "the conference" offers the most efficient means of bringing the synchronization about.

Basically, conference problems are problems in human relations and industry has been slow in recognizing the importance of personality problems, (A recent analysis of personnel discharge cases by William J. Reilly[1], employee relations counselor, reveals that 84% of the failures could be attributed to faulty human relations. Yet industry still puts primary emphasis on pure technical qualifications when selecting employees).

The importance and extent of the problems suggests a solution. In the spirit of specialization it is not necessary for each department head or other executives to possess all the qualifications of a human coordinator or to carry the full burden of organizing and running the conferences they need to call. There is no reason why administrative assistants, properly trained in the conference technique, cannot arrange for each conference and handle all the administrative detail when requested by the operating official. The technical information concerning the subject of the conference would of course be supplied by department head requesting the conference but from this point on most details could be accomplished by the administrative assistant.

On the question of time, when properly organized, the time spent in preparation will probably be more than compensated for by shorter conferences and superior decisions.

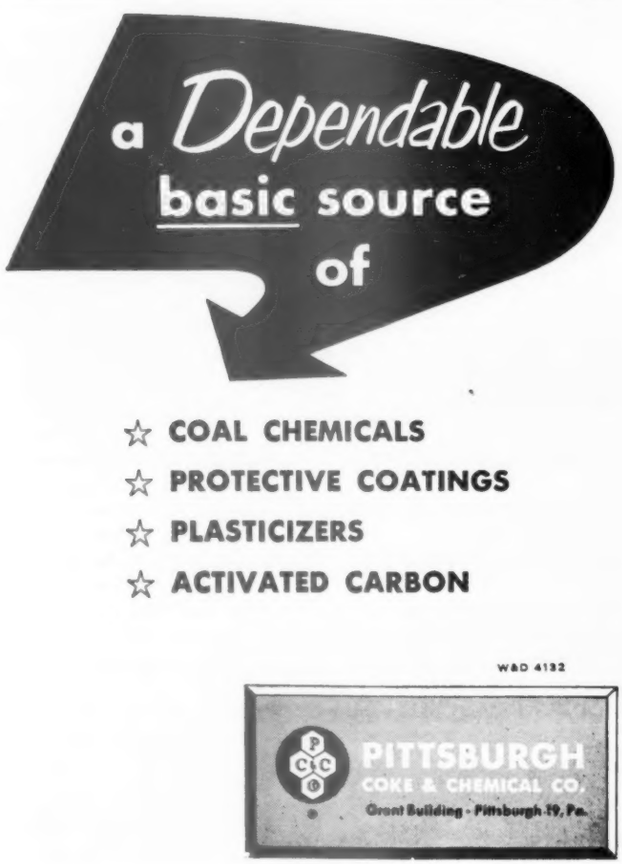
At this point I have the uneasy feeling of having presented a solution to a problem that represents nothing new. This leads to the obvious conclusion that the real problem has been missed; since, if the solution is valid, why hasn't it been put to use?

The answer to this belongs in the realm of the psychologist but from what I have read, the answer seems to tie back to a curious practice followed by man. In dealing with people, we seem to make no effort to recognize, analyze them to determine what principles are involved, and then govern future action accordingly. The whole affair is treated as a big mystery and failures are brushed off with the comment, "that's human nature, what can you do"?

Most of us may not have the time, the inclination nor the ability to solve the entire problem (including the psychological aspects) but we can make use of the mechanical features of the solution; such as, adequate preparation, written rules of procedure, written record of decisions, and adequate follow-up.

As an incentive to action the conferences of the type we are discussing may be small but like acorns they are prevalent and like acorns their results are long lived and often grow to mighty proportions.

[1]Reilly, William J., "Successful Human Relations," Harper & Brothers, New York, New York 1952 pg. 109.



FIRST ARMY CHEMICAL RESERVES TRAIN IN FIELD AT CAMP DRUM, N. Y.

By MAJOR JOHN F. CARROLL
New York Chemical Procurement District
Reserve Mobilization Detachment No. 10

IN THE PAST, USAR Chemical units from the First Army area have trained separately in such far away places as Army Chemical Center, Maryland; Fort Bragg, N. C., and Fort McClellan, Ala. So with a view toward unified training and improving the field effectiveness of the Chemical Corps Reserve Units in the First Army area, Colonel Theodore P. Gahan, Chemical Officer, arranged for the 31 Troop Units in the First Army Area to take their summer training simultaneously at Camp Drum, New York. A normal command structure was formed with Groups over Battalions, Battalions over Companies, etc. Because there were two Groups present, a temporary experiment was undertaken by putting all units under a provisional Headquarters which was designated as the First Chemical Training Brigade (Prov.), commanded by Colonel F. L. McGuane.

The following units attended the camp:

Unit	Home Station	Commanding Officer
464th Cml Group	New York, N. Y.	Col. F. L. McGuane
465th Cml Group	Paramus, N. J.	Lt. Col. C. E. Mathe
395th Cml Bn (Service)	Boston, Mass.	Lt. Col. W. H. Estey
450th Cml Bn (")	Waterbury, Conn.	Lt. Col. C. B. Allen
451st Cml Bn (Smoke Gen)	Camden, N. J.	Lt. Col. E. S. Pierce
452nd Cml Bn (Service)	Paramus, N. J.	Lt. Col. H. M. Bennett
454th Cml Bn (")	Boston, Mass.	Lt. Col. S. K. Ford
469th Cml Bn (")	Willimantic, Conn.	Maj. H. F. Laws
475th Cml Bn (")	Buffalo, N. Y.	Lt. Col. J. E. Bellanca
477th Cml Bn (")	New York, N. Y.	Maj. S. Solomon
479th Cml Bn (")	Providence, R. I.	Lt. Col. M. A. Capone
400th Cml Laboratory	Paramus, N. J.	Maj. H. J. Karpinski
402nd Cml "	Niagara Falls, N. Y.	Lt. Col. H. H. White
304th Cml Co. (Depot)	New York, N. Y.	Capt. S. C. Gelb
320th Cml Co. (Smoke Gen)	Buffalo, N. Y.	Capt. G. C. Clabeaux
340th Cml Co. (Processing)	Portsmouth, N. H.	Lt. L. Mackles
342nd Cml Co. (")	Providence, R. I.	Capt. A. Bucci
355th Cml Co. (Smoke Gen)	Buffalo, N. Y.	Capt. R. J. Brick
357th Cml Co. (")	Camden, N. J.	Capt. B. E. Bajewicz
363rd Cml Co. (")	New York, N. Y.	Capt. E. P Mahoney
364th Cml Co. (Maint)	Paramus, N. J.	Lt. E. J. Moran
371st Cml Co. (Decon)	Rochester, N. Y.	Lt. H. Camillo
380th Cml Co. (Maint)	Poughkeepsie, N. Y.	Capt. R. L. Fabrizio
381st Cml Co. (Decon)	Providence, R. I.	Lt. A. R. Anderson
802nd Cml Det (TI)	New York, N. Y.	Capt. W. S. Fairhurst
803rd Cml Det (TI)	Buffalo, N. Y.	Maj. J. W. Rickey
804th Cml Det (TI)	New York, N. Y.	Capt. W. L. Hegewood
805th Cml Det (TI)	New York, N. Y.	Capt. R. S. Rabinowicz
806th Cml Det (TI)	New York N. Y.	Capt. A. S. Rappaport
807th Cml Det (TI)	Buffalo, N. Y.	Lt. E. S. Osinki
808th Cml Det (TI)	Niagara Falls, N. Y.	Maj. E. F. Andrews

This was the first time in the history of the Chemical Corps since World War II that so many Chemical units were collected in one place, and their services were in demand. One tactical operation in which Chemical units stood out was "WHITE CLOUD" wherein a dozen Reserve-operated smoke generators blanketed a dawn assault-boat crossing of the Black River. The results were not only effective but created widespread interest in the camp. Also of considerable interest was the 27th Armored Division, NYNG, 4.2 Mortar School, and shoots conducted by Lt. Col. Arnold Arch, 27th Armored Division Chemical Officer, formerly of the New York Chemical Procurement District, aided by a group of former Chemical Mortar Battalion Officers.*

* While the 4.2 mortar is not now a Chemical Corps weapon, it is explained that Col. Arch was placed in charge of the School, in addition to other duties, because of his World War II experience with the mortar.

THE IMPACT OF the Reserve Forces Act of 1955 has yet to be felt. It is envisioned that as the effects of the Act become more evident, the USAR units will have many more personnel on their active rolls, and much more realistic training can be achieved. The present strengths of the units can be increased also by a vigorous recruiting campaign.

A full daily training program covering basic military subjects and weapon firing was instituted for all units with particular emphasis on their specific Chemical mission. The program was highlighted by a three-day field exercise which included a two-night bivouac, and the two cool nights under northern stars were enjoyed by most of the desk-bound civilian soldiers.

Chemical training at Camp Drum stressed "do-it-yourself." In past years units arriving at a Chemical post went right into their training work. The Processing Plants, Laboratories and Generators were all set up and waiting for them. On arriving at Camp Drum, Unit Commanders soon learned that the First Army Chemical Officer had made available to them more than $300,000 worth of Chemical Corps equipment, but it was all in packing crates, cases and cosmoline. A far cry from paper work training.

It was interesting to watch the men from the New Hampshire and Rhode Island Processing Companies uncrating the plant which had been delivered from the Depot. The plant had been moth-balled in 1950. The protective measures taken then paid off very well. The plant, while unassembled, was in perfect condition. Captain Adam Bucci, Commanding Officer of the 342nd

—U.S. Army Photo

Major John R. Maloney, inspecting officer for the 805 Chemical Technical Intelligence Det. is giving some points on the portable flame thrower to the detachment in the summer training camp at Camp Drum, N. Y.

—Photo by Maj. Carroll

"The food was never better" chorused a group from the New Jersey Cml units.

Processing Company, estimated that he has a three-year project ahead of him in assembling and training Reservists to operate the plant. The First Army has requested retention of all training equipment such as Mobile Laboratories, Smoke Generators and Processing Plants, and plans to retain them as is, in warehouses at Camp Drum, so that when the Reservists return next year, they can resume their projects where they left off. This is a very important arrangement, since most Reserve units, unlike the National Guard, are not yet equipped with their own organic motor vehicles for transportation.

The Camp Drum Reserve Training began on 22 July and all units returned to their home stations on 5 August. Among the Chemical Corps personnel who visited the units were Colonel William E. R. Sullivan, Deputy Chief Chemical Officer; Brig. General Clifford L. Sayre, Vice President of the Armed Forces Chemical Association; Brig. General Theodore H. Marshall, Commanding General, Mobilization Designation Detachment No. 10; Colonel Roy W. Muth, CONARC Chemical Officer; Colonel Theodore P. Gahan, First Army Chemical Officer, and Colonel William C. Hammond, Jr., Deputy First Army Chemical Officer. A post-camp critique is planned in the fall at Fort Jay, with a view toward ironing out the soft spots of the camp and making preparations for the 1957 tour of summer duty.

—Photo by Maj. Carroll

Lt. Col. Clarence Mathe, Jr., C.O. of the 465th Cml Group and Lt. Col. Horace M. Bennett of the 452nd Cml Battalion (N. J.) bid farewell to Lt. Col. Joseph Bellanca, C.O. of the 475th Cml Battalion (Buffalo) at the conclusion of summer training at Camp Drum, N.Y.

AMONG the problems encountered were making arrangements to bring all the Chemical Reservists to Camp Drum at the same time and to provide adequate messing and housing. This was worked out between the First Army Chemical Staff and G-3. Equipment for these thirty-one units was another big problem. Many of the regulated items were obtained from the Chief's Office, while other equipment was drawn from the various Chemical Depots. The Camp Drum Post Chemical Section was drawn from the First Army Chemical Section and Fort Dix Chemical activities. This section rendered support to the units while they were in camp. The Section consisted of 1st Lt. C. H. Creamer and 1st Lt. S. W. Hodges, Headquarters First Army, and 2d Lt. R. A. Donnelly, Post Chemical Section, Fort Dix, N. J. Six Chemical enlisted personnel were also made available from Fort Dix.

"The chow is tops," chorused the Chemics who were fed in consolidated messes run by Regular Army personnel from Fort Devens, augmented by Reservists. Checks on the quality of the instruction and the over-all operation were made by the personnel of the Headquarters First Army's Chemical Reserve Augmentation personnel who served as Training Inspectors.

All agreed that this summer training program was highly successful. For in addition to raising the standards for Home Station training during the winter months, it also brought into clear focus the problems that would be present on "M" Day.

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CHEMICAL CORPS PHOSPHATE DEVELOPMENT WORKS

Chemical Corps—TVA "Team Up" for National Defense at Muscle Shoals, Alabama

By SERGE TONETTI, MAJOR, CML. C.
Commanding Officer

THE CHEMICAL CORPS Phosphate Development Works, although a vital installation of the Chemical Corps, is relatively unknown to a large number of people both in and out of the Corps. This situation stems primarily from the high security classification which was assigned originally to this installation during its early days, at which time it was purposely referred to only as Site A.

It is to be noted that the designation "Phosphate Development Works" (PDW) was a deliberate misnomer to conceal the highly classified nature of its true purpose. It is interesting to note that the plant was commonly referred to by the local populace as "The Thing" and generally considered as being an AEC type project for processing uranium ores. An announcement made by Major General William M. Creasy, Chief Chemical Officer, in July 1954 revealed the fact that the true purpose of the Phosphate Development Works is the production of an intermediate compound used in the manufacture of nerve gas at the Rocky Mountain Arsenal Plant. This announcement made it possible to give public acknowledgment to the Chemical Corps-TVA team which had been formed to further the National Defense Program.

In view of the international situation, accelerated action was taken in 1950 to obtain an additional degree of preparedness in the field of Chemical Warfare. The Chief Chemical Officer was given full responsibility for the expansion of the country's nerve gas capability and was authorized to take necessary steps to obtain immediate positive results. Funds for initial design, engineering and construction were furnished from contingency monies available to the Secretary of Defense. At this point the Chief Chemical Officer established a task force group with authority for all matters concerned with this project, such as design, engineering, procurement, funding, security and administration. Due to the urgency of the international situation, a decision was made to "freeze" the design and proceed with construction.

TVA Cooperation

As a result of site selection surveys, a decision was made to establish the first three steps of the process at the Tennessee Valley Authority's Chemical (Wilson Dam) Plant at Muscle Shoals, Alabama. The last two steps were located at Rocky Mountain Arsenal at Denver, Colorado (referred to as Site B). This selection enabled the Chemical Corps to utilize the supply of phosphorus, power and technical knowledge of trained operating personnel made available by TVA in the interest of National Defense. Subsequently, a formal Memorandum of Agreement was entered into by the Army and TVA regarding operation and maintenance of the plant after completion of construction and proof testing.

TVA's support and cooperation have been salient factors toward the over-all progress made in developing the plant to its present state.

At the request of the Chemical Corps, TVA undertook a program of research to develop processes for the disposition of by-products from the Phosphate Development Works, most important of which was the by-product phosphorus oxychloride generated in the final step. As a result of TVA's work, an electric-furnace method was developed for the reduction of the phosphorus oxychloride to phosphorus trichloride, a basic raw material in two of the major process steps. Based on this work, an additional facility was constructed for this purpose. Not only did TVA's work reduce the required amounts of phosphorus and chlorine by more than half through the recovery of phosphorus trichloride, but it also increased the mobilization potential of the plant inasmuch as industry could not absorb the entire amount of by-product phosphorus oxychloride which would be generated.

Support by Chemical Industry

As indicated initially, the international situation required an accelerated program. This objective in the in-

terests of National Defense necessitated initiation of engineering and construction of the facility prior to completion of the development program by the Chemical Corps. Basic process criteria for design were furnished by the Chemical Corps, and in August 1950, actual design work was initiated by the Kellex Corporation (later known as the Vitro Corporation of America) on authority of a letter order. Architect Engineer Management contracts with Kellex Corporation as prime contractor and Southern Constructors as sub-contractor were negotiated in November 1950. In January of 1951 an AEM contract was negotiated with Monsanto as prime contractor and Leonard Construction Company as sub-contractor to build a chlorine plant adjacent to the Phosphate Development Works to serve as a feeder plant to the PDW.

Concurrent with design and initial construction of the Phosphate Development Works, The Chemical Corps and industry accelerated the development program. Many leading industrial concerns actively participated in this program, chief among which were the Monsanto Chemical Company, the Victor Chemical Works, Esso Research & Engineering Company (formerly Standard Oil Products), Mathieson Chemical Company (changed to Olin-Mathieson Chemical Corp.), Phillips Petroleum Company, Universal Oil Products Company, The Food Machinery & Chemical Corporation (Westvaco Chlor-Alkali Division). In addition, all the many manufacturers of chemical equipment contributed to the program by their expedited deliveries.

Construction and Initial Proofing

The construction phase of the Phosphate Development Works and the Chlorine Plant was initiated in the spring of 1951, under the supervision of the Corps of Engineers, and all work was completed in 1953. A decision was subsequently made to sell the Chlorine Plant through competitive bidding. It was eventually bought by the Diamond Alkali Company. As a result of their recent work establishing the feasibility of using salt generated from contaminated by-product hydrochloric acid, Diamond Alkali joined the ranks of the many industrial companies which have supported the Phosphate Development Works. Their patience, understanding and cooperation in meeting the erratic chlorine demands necessitated by test production runs have been most helpful.

Upon completion of major construction by September 1953, the responsibility for the Phosphate Development Works was transferred from the Corps of Engineers to the Chemical Corps Materiel Command. By this time it was apparent, as a result of initial test operations, that the Chemical Corps was faced with the customary "shake-down" problems inevitable in a "crash" construction program based on incomplete development. National Defense and the international situation had predicated this risk. As a result of the magnitude of the "shake-down" problems and the desire to "round out" the plant to a higher mobilization potential, the Chief Chemical Officer directed, in February 1954, that the installation be reassigned to the Chemical Corps Research and Engineering Command. Effective 1 March 1954 the responsibility for the technical staff control of Phosphate Development Works was assigned to the Chemical Corps Engineering Command (formerly the Engineering Agency).*

Chemical Industry Helps Again

Primary engineering emphasis naturally was placed on the basic process during the initial period, March-December 1954. Towards the latter part of the year a portion of the engineering effort was diverted towards the problems associated with the by-product phosphorus oxychloride facility.

It was at this point that chemical industry again stepped in to lend PDW a helping hand. The necessity for this help resulted from the need to manufacture certain quantities of end product to meet defense requirements, the production of which generated considerable amounts of phosphorus oxychloride. These amounts were in excess of the reduction capability of the by-product facility at that time. In answer to the Chemical Corps' plea for assistance, the Department of Commerce responded and the country's major phosphorus oxychloride producers unselfishly agreed to curtail their own facilities so as to use PDW by-product oxychloride. In the course of this program many tons were accepted by the following companies: Monsanto Chemical Company; Victor Chemical Works; The Food Machinery & Chemical Corporation (Ohio-Apex Division); and the Oldbury Electro-Chemical Company.

It is also noteworthy that at this time the National Lead Company, in connection with operation

(Continued on page 36)

MAJOR SERGE TONETTI

Major Tonetti entered the Chemical Corps in 1941 subsequent to receiving his Bachelor's degree in Chemical Engineering from the City College of New York. He attended the 2nd OCS Class at Edgewood, Md., and received his commision in July 1942. During the last ten years he has been associated primarily with various phases of research and engineering work and served as Executive Officer of the Chemical Corps Engineering Agency for two years subsequent to its activation. Major Tonetti has been at PDW since January 1954 and assumed command in July 1955.

*Operational control recently reassigned to Materiel Command—Ed.

EXECUTIVE DEVELOPMENT

(Continued from page 17)

Colonel Jack E. Babcock, Chief, Military Arts Division, The Chemical Corps School.

Dr. John R. Beishline, Professor of Business Administration, University of Texas, Brig. General USA (ret.).

Mr. Glenn Bryce, Office of the Comptroller, Office Chief Chemical Officer.

Colonel Carl V. Burke, Commanding Officer, Field Requirements Group.

Brig. General William Currie, Assistant Chief Chemical Officer for Planning and Doctrine, Office Chief Chemical Officer.

Mr. Edgar A. Crumb, Executive Director, Office Chief Chemical Officer.

Colonel George W. Dorn, Chief Publications Division, The Chemical Corps School.

Dr. Don C. Faith, Associate Professor of Educational Psychology and Director of Men's Activities, The George Washington University, Brig. General USA (ret.).

Dr. C. L. Fleming, Jr., Deputy to the Vice-President for Products Research, Esso Research and Engineering Company, New York City.

Dr. Per K. Frolich, Deputy Chief Chemical Officer for Scientific Activities, Office Chief Chemical Officer.

Dr. James E. Gates, Dean of the College of Business Administration, University of Georgia, Athens, Georgia.

Mr. Howard Goheen, Chief Career Management Branch, Civilian Personnel Division, Office Deputy Chief of Staff, Logistics, Department of the Army.

Lt. Colonel James N. Granade, Jr., Military Arts Division, The Chemical Corps School.

Lt. Colonel Truett K. Grant, Executive Officer, The Chemical Corps School.

Colonel John J. Hayes, Commanding Officer, Fort Detrick, Maryland.

Lt. Colonel Warren T. Hunt, Executive Officer, Fort Detrick, Maryland.

Colonel Thomas H. James, Commanding Officer, Chemical Corps Training Command.

Dr. B. H. Jarman, Professor of Education and Dean of Summer Sessions, The George Washington University.

Mr. Edward S. Johnson, Office of the Comptroller, Office Chief Chemical Officer.

Mr. C. George Jones. Programming Coordinating Office, Office Chief Chemical Officer.

Dr. H. DeWayne Kreager, Industrial Consultant, Washington, D.C.

Colonel Emory A. Lewis, Chief Training Division, Chemical Corps Training Command.

Dr. Calvin D. Linton, Professor of English Literature and Dean of Columbian College, The George Washington University.

Mr. C. W. Lombard, Deputy Comptroller of the Chemical Corps, Office Chief Chemical Officer.

Captain B. J. McKiernan, Special Assistant to the Commanding Officer, Finance and Accounts Office, U.S. Army, Washington, D.C.

Mr. Curtis Mitchell, Public Relations Counsel, New York City.

Lt. Colonel Charles A. Morgan, Jr., Assistant to Chief, Military Arts Division for Management, The Chemical Corps School.

Colonel C. W. Nussbaum, Comptroller of the Chemical Corps, Office Chief Chemical Officer.

Mr. William Oncken, Jr., Special Assistant to the Chief of Staff, U.S. Army for Civilian Personnel.

Mr. Duane H. Roepke, Career Management Division, Office Chief Chemical Officer.

Brig. General Jacquard H. Rothschild, Commanding General Chemical Corps Research and Development Command.

Mr. James Strother, Office of the Comptroller, Office Chief Chemical Officer.

Brig. General Marshall Stubbs, Commanding General, Chemical Corps Materiel Command.

Colonel Edwin Van Keuren, Commandant, The Chemical Corps School.

Lt. Colonel Arthur Williamson, USAF Representative, The Chemical Corps School.

Colonel Cecil H. Wood, Chief Operations Division, The Chemical Corps School.

ONE OF THE HIGHLIGHTS of the course was the luncheon program, where the guest speakers and students met around the luncheon table and discussed, informally, points of interest presented by the speakers. In these groups of eight, the students and speaker became acquainted and real learning took place through informal discussion.

The students of the Tenth Chemical Officers Advanced Class were enthusiastic over the conduct of the Management Course and sincerely indorsed it for all subsequent classes. The class was augmented by the attendance of military and civilian personnel from all of the Chemical Corps Commands, and the office of the Chief Chemical Officer. Officers of the Women's Army Corps from the WAC Training Center, Fort McClellan, also attended. The following personnel attended and received Department of the Army Certificates of Training:

FROM: Tenth Chemical Officers Advanced Class

Colonel Robert E. Stover; Lt. Colonel Roger W. Kemp; Majors Bernard F. Allen, Robert K. Bradford, John A. Cassidy, Frederick F. Claflin, Charles W. Cook, John P. Crispell, James E. Davies, Lawrence M. Dellinger, Theodore L. Enteles, Malvin F. Glass, Jr., William G. Heslin, and Eugene F. Lennon; Captains George M. Alter, Henry E. Bowker, Julian G. Brunt, Steven S. Crowell, John E. Fay, Charles W. Forsthoff, William M. Home, Halver E. Hude, Jack K. Lewis, William T. Lipscomb, Sherman S. Marable, William C. Miles, William Nelson, William D. Owens, Monte I. Peterson, Bernard L. Render, Robert A. Shade, Harold W. Shear, Buren R. Shields, Jr.; First Lieutenants Peter E. Hexner and Eugene M. Simonson.

FROM: Office Chief Chemical Officer

Colonel E. J. Collins; Dr. Michael Filippi; Dr. Nathan Gordon; Major Ralph F. Lounsberry; Lt. Colonel Jack R. Whitley.

FROM: Chemical Corps Training Command

Lt. Colonel Joseph S. Bochenowski, Artillery; Captain Edward D. Hoffman; Major Franz L. Olson.

FROM: Research and Development Command

First Lieutenant William H. Eaton; Major Jacob G. Hellman; Mr. Charles Miller; Captain Thomas L. Stovall.

FROM: Chemical Corps Materiel Command

Mr. Arthur Brickman; Mr. Woodrow Glasgow; Mr. Edward Kelley; Captain Joseph W. Searcy.

FROM: Chemical Corps Engineering Command

Lt. Colonel Oliver R. Hertel.

FROM: Women's Army Corps

Major Jimmie B. Dollahite; Major Erma D. Keener; Captain Berry K. Kunert; Major Clara M. Mathews; Major Billie D. Melvin.

Planning of the Management Course for the Eleventh Chemical Officers Advanced Class is underway. The program for next year will be similar in scope to this year's program but the hours of instruction will be doubled. One basic change will be made: the Management Techniques subjects such as Program Management, Financial Management, and Management Engineering will be conducted throughout the academic year and will be integrated with the normal school instruction. The guest speaker program will be conducted at the end of the course. Likewise it is anticipated that a greater number of representatives will attend from the various organizations of the Chemical Corps.

Reports reaching the Chemical Corps School appear to indicate that the Management Program has earned a permanent niche in the Chemical Corps Educational System. Career development and executive develop-

(Continued on page 36)

TRAINING CIVILIAN WORKERS IN WARTIME

By DR. LEO P. BROPHY
Chemical Corps Historical Office

AMONG THE PROGRAMS on which the Chemical Corps is laying considerable stress is the training of civilian workers. Like so many present day programs, this had its origin in World War II, when the number of civilian employees, particularly in manufacturing activities, increased tremendously.

In the years between World War I and World War II manufacturing activities in the Chemical Warfare Service (the present Chemical Corps) came almost to a halt. Aside from the manufacture of a limited number of gas masks at Edgewood Arsenal, there was practically no procurement of materiel. Not until late in 1939 was there any appreciable procurement activity, although there was, of course, a great deal of emphasis on procurement planning.

Procurement of gas masks on a considerable scale was introduced late in 1939 under the Educational Order Program. This program was provided for in legislation enacted by Congress and approved by the President in June 1938. An educational order was defined as "a contract placed without advertising, for a limited quantity of a desired technical article, with any selected facility." Immediately upon the enactment of the legislation the Secretary of War appointed a board of officers made up of representatives from the offices of the Assistant Secretary of War, the War Department General Staff, and the technical services. The board selected six Army items for educational order procurement, among them the gas mask. The first educational order for the mask was drawn up late in 1939 and was followed in 1940 and 1941 by contracts with some ten prime contractors. The Educational Order program enabled the Chemical Warfare Service to take its first faltering step toward actual wartime procurement.

A second step in wartime procurement was taken as a result of the Munitions Program of 30 June 1940. This realistic program, sponsored by the War Department and the Council of National Defense, aimed to putting the U. S. in a proper posture for war. To finance the program Congress appropriated a great deal more money than it had in the peace time years. Once war was declared appropriations reached almost limitless proportions.

THESE increased appropriations enabled the Chemical Warfare Service to mobilize for war. During the first year and a half of war, when the Army was busy furnishing troops with their initial equipment, particular stress was placed on industrial mobilization. During this period three new chemical arsenals were built at Huntsville, Alabama, Pine Bluff, Arkansas, and Denver, Colorado. Several new depots were also activated, and the chemical warfare procurement districts offices undertook writing contracts for chemical warfare munitions on a scale never contemplated in the peacetime years. From a total of less than 5,500 in June 1941, the civilian strength of the Chemical Warfare Service rose to a peak of over 28,000 in June 1943.

The training of civilian workers engaged in chemical warfare manufacturing and kindred activities became a primary problem of the Chemical Warfare Service. Like other elements of the armed forces and many civilian industries, the CWS entered a period of all out production without an experienced labor force. Production workers and even supervisors in many cases had never seen products they were to produce. It could not have been otherwise for these products had no commercial counterparts. Piecework jobs could be taught in a relatively short period of on-the-job training, but the training of semi-skilled and skilled workers, supervisors and inspectors, was much more involved.

The first organized training program in the Chemical Warfare Service was initiated in 1940 in connection with the educational order program for gas masks. Many new inspectors were needed in the procurement districts when these contracts were in effect. The prospective inspectors came to Edgewood Arsenal to receive instruction in technical methods and quality criteria before being assigned to duty.

Shortly after the outbreak of war a training program, known as the apprenticeship program, got under way at Edgewood Arsenal. Sponsored by the Office of the Assistant Secretary of War, this program aimed at training young apprentices in government installations. In January 1942 one hundred apprentices began training in such crafts as glassblower, automobile mechanic, blacksmith, carpenter, coppersmith, chemical plant operator, electrician, leadburner, machinist, painter, pattern maker, pipefitter, plumber, rigger and sewing machine adjuster. Of that number only two eventually completed their training. The others were all inducted into the armed forces under the Selective Service Act.

ORGANIZED civilian training did not get well under way in the Chemical Warfare Service until after the Army Service Forces (ASF) was activated in the Army in March 1942. The ASF, headed by General Brehon Somervell, was established to coordinate all logistical activities throughout the Army. The Chief of the Chemical Warfare Service, like the Chiefs of all technical services, reported to the commanding general, ASF. In August 1942 General Somervell's headquarters inaugurated a series of three training programs which had been developed cooperatively by the Army and the War Manpower Commission. These three programs, each of which covered ten hours of instruction, provided for the training of supervisors in the basic skills of leadership, job management, and instruction of workers under their supervision. Later a fourth training program, a job safety program, was inaugurated. These programs continued throughout the year.

Following the initiation of the supervising program a number of additional training programs were undertaken in the Chemical Warfare Service. Because of the nature of their operations, the arsenals undertook civilian training on a larger scale than other chemical installations. Even skilled technicians and professional employees needed further training because their hurried wartime

background was inadequate. A typical arsenal, in this respect, was Rocky Mountain. There between the fall of 1942 and the end of 1945 the following courses were offered on a continuing basis: a 2-to 6-week course for inexperienced chemical engineers; a 1-week course in analytical procedures for chemists; a 4-to 8-week course at factories for instrument makers and refrigerator plant operators; a 1-month course in chemical plant operation and safety conducted by the University of Colorado (course was given twice), a similar 2-month course conducted simultaneously by three Colorado universities (course given once), and a 6-week course for laboratory technicians at the University of Denver (course given once).

THE training program at Rocky Mountain Arsenal, elaborate as it was, did not provide any extensive training for clerks and stenographers. There was a good reason for this, namely, that Rocky Mountain was never faced with any serious shortage of workers in these categories. At Huntsville and Pine Bluff Arsenals, on the other hand, clerks and stenographers were at a premium all during the wartime period. Among the most important features of the training programs at Huntsville and Pine Bluff was the training, on a continuous basis, of clerks and typists. The most promising candidates among the girls in the plants were transferred to the offices and trained as clerks and typists.

Since Huntsville and Pine Bluff were not situated near colleges or universities, no efforts were made at those arsenals to carry out a cooperative training program with private educational institutions. Edgewood Arsenal and Rocky Mountain Arsenal were more alike in this respect. The various colleges in Baltimore cooperated with the CWS in setting up courses for its employees. At times the United States Office of Education also cooperated. For example, in 1945 the CWS, in cooperation with the United States Office of Education and the University of Baltimore, organized a 15-week course, two and one-half hours per week, for supervisors. By July 1945, 178 supervisors had completed this course and the results, in the opinion of the commanding general of the CWS, were excellent.

In the administration of the training programs some arsenals did a better job than others. Those installations which had the best civilian training records followed a few basic principles which made all the difference between good and bad administration. Among these principles the following three were outstanding: (1) all supervisors were required to take certain basic instruction; (2) the commanding officer personally encouraged the training programs; and (3) there was good coordination between the military and civilian key personnel on all training matters. Today those basic principles still apply.

EXECUTIVE DEVELOPMENT

(Continued from page 34)

ment has become established and a centralized source for promulgating this development has been realized. However, it is not anticipated that the full effects of the Chemical Corps Executive Development Program will be felt for a few years. As in other cases where the doctrine taught by our service schools prior to World War II and Korea paid off when finally put to test, so will executive development of the Chemical Corps as presented in The Chemical Corps School pay off in the future development of our Corps.

PHOSPHATE DEVELOPMENT WORKS

(Continued from page 33)

of the AEC's Fernald, Ohio, Uranium Ore Processing Plant was giving similar assistance through their usage of PDW by-product hydrochloric acid.

"Two Plants for the Cost of One"

The major engineering effort during Calendar Year 1955, as in many chemical plants these days, continued to be that associated with the by-product problem; more specifically, the problem of reducing the amounts of phosphorus oxychloride which grew as a result of major process improvements and increased capability in the basic design. Security measures preclude revealing capability data. However, the degree of success can be gauged by the fact that as a result of the Chemical Corps-TVA-Industry teamwork, the capacity is such that the Army now has the equivalent of "two plants for the cost of one."

In retrospect, some of the major problems that were met and resolved were (1) rapid corrosion and failure of metallic charcoal dump valve, seat and thermowells—solved by substitution of carbon; (2) removal of "gunk" from the furnace off-gas stream—solved by substitution of the filtration system with a newly designed evaporator system plus the addition of chlorine to the furnace product stream, resulting in more easily handled solids; (3) failure of pumps because of "gunk"—solved by redesign of pumps; (4) low furnace conversions and operating problems—solved by "living" with the problem and gradual development of improved operating technique.

The work associated with this facility is by no means completed, however. The major problems remaining are that of rapid corrosion of the furnace refractory lining resulting in an inordinate amount of "down" time, and that of attaining higher reduction conversion of the phosphorus oxychloride. A coordinated Chemical Corps-TVA program, assisted by various consultant and industrial firms, is presently in progress for a concerted attack on these problems.

Enlisted Scientific & Professional Personnel Program

Although the Enlisted Scientific and Professional Personnel (ESPPs) Program at the Chemical Corps Phosphate Development Works is planned to be subject of a future article for this Journal's readers, it would be impossible for the author to conclude this article without a few words for these fine men who have played such an outstanding role in the success achieved at PDW.

The author has no hesitancy in stating that these men were utilized to the fullest possible extent in accordance with the Army's ESPP program. Their acceptance of the high degree of responsibility given to them either in operation or process engineering work coupled with their outstanding performance and pride in PDW made them an invaluable member of the Chemical Corps-TVA-Industry team which made the Chemical Corps Phosphate Development Works possible.

CHEMICAL CORPS NEWS

CHIEF OF STAFF VISITS ARMY CHEMICAL CENTER

EDGEWOOD, MD.— General Maxwell D. Taylor, Chief of Staff of the Army visited the Army Chemical Center on Monday 20 August. He was accompanied by Lieutenant General Carter B. Magruder, Deputy Chief of Staff for Logistics and other members of his staff.

He arrived at the local army airfield by plane early in the afternoon, where he and his party were met by Major General William M. Creasy, Army Chemical Corps Commander and Brigadier General Marshall Stubbs, Commanding General Army Chemical Center. A seventeen gun salute was fired and the 327 Army Band played "Ruffles and Flourishes" as the General inspected the honor guard consisting of the 9710 Military Police Detachment.

Following the honors General Taylor and party proceeded to Chemical Warfare Laboratories and were briefed on the organization and mission of the Center, Chemical Corps Materiel Command, and Chemical Warfare Laboratories.

Arrival of General Maxwell D. Taylor, Army Chief of Staff and party —Left to Right: Lt. General Carter B. Magruder, Major General William M. Creasy, Brig. General Jacquard H. Rothschild, General Taylor, and Brig. General Marshall Stubbs.

U.S. Army Photo

TRANSFER OF MUSCLE SHOALS PLANT

The Muscle Shoals Phosphate Development Works of the Chemical Corps at Sheffield, Alabama was transferred on 1 July 1956 from the operational control of the Chemical Corps Engineering Command to Chemical Corps Materiel Command. The transfer of this plant, developed with cooperation of TVA, concludes alteration work, under the supervision of Mr. William S. Harmon, Director for Plants and Processes, Chemical Corps Engineering Command. He has returned to duty at Army Chemical Center, Maryland. The plant is for the manufacture of an intermediate used in the production of nerve gas.

COLONEL CARL V. BURKE IS NEW SCHOOL COMMANDANT

Colonel Carl V. Burke is the new Commandant of the Chemical Corps School at Fort McClellan, Ala. He succeeds Col. Edwin Van Keuren who retired June 30.

Colonel Burke, since January 1955, has been the chief of the Doctrine Division of the Chemical Corps Training Command at Ft. McClellan. The Division was recently reorganized as The Field Requirements Agency. A native of Colorado Springs, Colo., and a 1933 graduate of Colorado College there, Colonel Burke began his military career as an instructor in training management at the Chemical Warfare School then located at Edgewood Arsenal, Md. In 1942 he joined the staff of the Chemical Officer, Southwest Pacific Theater, in Melbourne, Australia. He also served as Chemical Officer at Milne Bay, Cape Sudeat in New Guinea, and later in Manila, P. I.

Since World War II Colonel Burke has served as instructor at the Chemical Corps School, and at the Infantry School, and has attended the Command and General Staff College and the Army War College. He has been awarded the Legion of Merit and the Bronze Star Medal.

HONORED FOR SUPERIOR SERVICE

A U. S. Government Award of $300.00 for "superior performance of duty" was recently given to Mr. Abe L. Selmann, Chief, Inspection Engineering Branch, New York Chemical Corps Procurement District, New York City, in recognition of his services as Contracting Officers' Representative.

Presentation of the award, the first of its kind given in the New York District office, was made by Colonel Harold Walmsley, Commanding Officer.

RETIREMENTS:—

BRIG. GENERAL JOHN R. BURNS

Brigadier General John R. Burns, Army Chemical Center commander for the past two years, retired on June 30, ending a military career of 30 years.

General Burns, born in Washington, D. C., was graduated from the United States Military Academy in 1926. During World War II when a lieutenant colonel, he established and commanded Dugway Proving Ground, the Chemical Corps test station in Utah and later served as chemical officer for the Sixth Army in the Philippine Islands. He was in command of the Chemical Corps Training Center at Fort McClellan, Alabama, when promoted to Brigadier General in August 1954.

General and Mrs. Burns plan on making their home in Charleston, S. C.

COLONEL THOMAS H. JAMES

Colonel Thomas H. James, commanding officer of the Chemical Corps Training Command at Fort McClellan, Ala., was retired at a parade in his honor there on June 30. He had served in the Infantry and Chemical Corps for more than 30 years.

Colonel James was graduated from the U.S. Military Academy in 1926. He joined the Chemical Warfare Service (now the Chemical Corps), as a unit commander, in 1936.

As commander of the 81st Chemical Battalion in World War II, Colonel James was wounded in action during the initial Allied landing on the Normandy coast on D-Day. His war service in Europe covered the period October 1943 to July 1944, for which he was awarded the Bronze Star Medal and the Purple Heart.

After the war, in 1951, Colonel James returned to Europe for duty as Chief Chemical Officer of the U. S. Forces there and remained until March 1953. He was then assigned as Chief, Inspection Division, Headquarters, Chemical Corps Materiel Command, Edgewood Arsenal, Md. In April 1954 he was assigned to Fort McClellan, Ala., for duty as Commanding Officer of Special Troops of the Chemical Corps Training Command. Five months later he became Deputy Commander of the Chemical Corps Training Command, and on September 1, 1955 he was assigned as Commanding Officer.

Colonel James was born in Bishopville, S.C.

COLONEL EDWIN VAN KEUREN

Honors for more than 14 years of service in the Chemical Corps were accorded Col. Edwin Van Keuren at a ceremonial retreat parade on the occasion of his retirement June 29 at Fort McClellan, Ala.

Colonel Van Keuren, one of the Directors-at-Large of A.F.C.A. during 1955, served as Commandant of the Chemical Corps School, Chemical Corps Training Command, since March 1953. He will make his home in Jacksonville, Ala., where he has joined the faculty of Jacksonville State Teachers College to teach political science and economics.

Colonel Van Keuren graduated from Lehigh University in 1923, and entered on active duty as a Captain in 1942. Meanwhile he had earned a Masters degree at Lehigh and a Ph.D. degree in Education at New York University. After attending Chemical Corps School he returned there as an instructor, Director of Training and Executive Officer. Later he was assigned to the Far East and served as Chemical Officer of Garrison Force Headquarters on Iwo Jima, and still later to duty on Saipan. He was integrated into the Regular Army in 1947. In 1948 he was appointed Commanding Officer of Edgewood Arsenal and in 1951 returned to the Far East, where at Camp Gifu, Japan, he served as Commanding Officer and as Commandant of the Far East Theater Chemical Corps School.

Colonel Van Keuren has been awarded the Bronze Star Medal and the Army Commendation ribbon.

CAPTAIN GERSHATER IS HONORED

U.S. Army Photo

Hon. Hugh M. Milton congratulates Captain Gershater in presenting him the Freedom Foundation Award. At left, Mrs. Gershater and Col. Henry M. Rund, then Executive Officer, Office Chief Chemical Officer.

Capt. Ephriam M. Gershater, Asst. Executive Officer, Office of the Chief Chemical Officer, Department of the Army, recently received a Freedom Foundation Third Place Award in connection with a contest regarding patriotic writings. The award was presented by the Honorable Hugh M. Milton, Assistant Secretary of the Army.

Capt. Gershater's presentation was a letter in which he stated, "It is necessary that I swear, as Tom Jefferson did, eternal hostility to every form of tyranny over the mind of man."

Capt. Gershater now assigned as a student at the Command and General Staff College, Ft. Leavenworth, Kansas, was recently honored with a luncheon given by his associates in the Chief's office.

NEW POST FOR DR. SPORN

Dr. Eugene M. Sporn, Biochemist from Wisconsin and George Washington Universities, formerly Deputy Chief of Research Division Headquarters, Chemical Corps Research and Development Command, Gravelly Point, Virginia, has assumed his new duties as Deputy Chief, Comparative Physiology Branch of the Medical Research Directorate, Chemical Warfare Laboratories, at Edgewood, Maryland.

Dr. Sporn served in the Biological Warfare Laboratories at Fort Detrick, Maryland, 1947 to 1954.

OBITUARIES

COL. LEWIS M. McBRIDE

Colonel Lewis M. McBride, who served with the Army Chemical Corps from 1920 until 1944 and who was a key figure in the development of various chemical weapons, died on June 30 at the Veterans' Hospital in Long Beach, California. Funeral services were held at the Arlington National Cemetery July 11.

Colonel McBride was born in 1879 in Iowa, and served with the Colorado National Guard from 1904 until 1910. He was commissioned a Captain in the Corps of Engineers in 1918 and transferred to the (then) Chemical Warfare Service in 1920. At the time of his retirement in 1942 he was an instructor and department head at the Chemical Warfare School at Edgewood, Maryland. Shortly after retirement he was recalled to active duty and served until 1944.

Colonel McBride was an enthusiastic and industrious inventor and held several military patents. His small machine shop was an integral part of the McBride household and was moved with each change of station. He was one of the earliest to build a rifle-barrelled mortar, an item which was later accepted for further test and development at Edgewood Arsenal. The grooved barrel became one of the key characteristics of the now-famous 4.2 mortar, which won great distinction in World War II. Colonel McBride invented a new method for filling and sealing liquids in shells for this mortar, a technique still in use today.

Colonel McBride is survived by his wife and six children.

COL. STUART A. HAMILTON

Col. Stuart A. Hamilton, Chemical Corps, USA., Retired, 63, who experienced the fall of Corregidor and the infamous "death march" on Bataan in the Philippines, and then three and one-half years as a prisoner-of-war of the Japanese in Manchuria, died at the hospital at Army Chemical Center, Maryland, on July 24.

Col. Hamilton retired in 1947 because of ill health believed to be a result of his imprisonment. He suffered a heart attack at his home near Churchville, Md., and was rushed from there to the hospital. Funeral services and burial were at Arlington National Cemetery.

Colonel Hamilton was a graduate of the U.S. Naval Academy in 1916. After graduation he transferred the same year to the Coast Artillery Corps of the Army. He was detailed for duty with the Chemical Warfare Service of the Army in 1926 (name subsequently changed to "Chemical Corps") and transferred to that service in 1929. He was a graduate of the Command General Staff School at Fort Leavenworth, Kansas, and the Chemical Corps School and had served on the General Staff of the War Department prior to World War II. He is survived by his wife and a son, Major Stuart A. Hamilton, Jr., Artillery officer, stationed at Third Army Headquarters, Fort McPherson, Georgia.

Colonel Hamilton was awarded the Legion of Merit and the Purple Heart with Oak Leaf cluster. His service in the Philippines in World War II included duty as a chemical officer on the staff of General Douglas MacArthur and later as the chief chemical officer at the headquarters on beseiged Corregidor of the late General Jonathan M. Wainwright. It was during this period of Col. Hamilton's service on Corregidor that the chemical section there improvised a chemical laboratory in one of the tunnels on the island stronghold. Among the numerous things they did for their beseiged comrades was the production from bleaching powder of a much needed insecticide and also the extraction of sulphuric acid from the liquid filling of FS smoke shells for use in storage batteries.

LT. COLONEL WALTER F. PLANK

Funeral services for the late Lt. Col. Walter F. Plank, Chemical Corps, who met his death, presumably from drowning, while enroute riding a motor scooter, from Maxwell Air Force Base to his permanent station at the Chemical Corps School, Fort McClellan, Ala., were held at Arlington National Cemetery on July 16.

Colonel Plank's body was found on July 10 in a body of water near a bridge, according to information received by friends in Washington, D. C. Formal investigation of the cause of death has been undertaken by both the Army and State authorities.

Colonel Plank was instructor at the Chemical Corps School. He was a native of New Jersey, a graduate of Pennsylvania State College and served in World War II on the staff of the Chief Chemical Officer of the European Theater.

135,000 SEE CML. CORPS EXHIBIT

The extensive exhibit of the Army Chemical Corps, which was shown initially at the 10th Annual Meeting of the A.F.C.A. in Cleveland in 1955, was displayed at the New York City Coliseum during May where it was viewed by approximately 135,000 persons, according to the authorities in charge. The showing in New York was in connection with the 1956 International Home Builders Exposition.

The Chemical Corps exhibit is to be shown again at the National Chemical Exhibition of the American Chemical Society in Cleveland November 27-30, 1956.

A.C.C. DONATES $5,550 TO CANCER SOCIETY

Donations to the American Cancer Society, amounting to $5,550, were collected from military and civilian personnel at the Army Chemical Center post last year. In recognition of this gift the Society recently presented its Certificate of Merit to the Center.

U.S. Army Photo

YOUNG CHEMISTS

Four members of Boy Scout Troop 799, Fort Detrick, Frederick, Maryland, pose proudly with the troop's prize winning exhibit. Entitled, "Chemistry in Peace and War," the exhibit won a blue ribbon at the recent National Capitol Area Scouting Exposition in Washington, D. C. The parents of many of the scouts in Troop 799 are scientists at the Army Chemical Corps Biological Warfare Laboratories at Fort Detrick. The Scout Master is Dr. Harold A. Neufeld.

HEADS PROCUREMENT AGENCY

Lieutenant Colonel James R. Chapman has been appointed commanding officer of the Army Chemical Center (Maryland) Procurement Agency. A native of Kentucky, Colonel Chapman is an alumnus of West Kentucky State Teachers' College. He entered the Army as a second lieutenant after graduation in 1940.

During World War II he served in the Mediterranean Theater of Operations as a chemical staff officer and later as commanding officer of the 2d Chemical Mortar Battalion.

Among his assignments since the War was a tour of duty in the Far East from 1951 to 1954.

COLONEL BARKSDALE TO WAR COLLEGE FACULTY

Colonel Stoessel S. Barksdale, Chemical Officer Fifth Army Headquarters, Chicago, has recently been re-assigned as a member of the Faculty of the Army War College at Carlisle Barracks, Pennsylvania.

Colonel Barksdale has served as Assistant Commandant of the Chemical School at Fort McClellan, Alabama. During World War II he served with the Army in the European Theater. He was awarded the Bronze Star Medal, Purple Heart. He served in the Far East at General Headquarters in Tokyo in 1948 and 1949.

DETRICK SCIENTIFIC DIRECTOR

Dr. Riley D. Housewright has been appointed Scientific Director of the Army Chemical Corps Biological Warfare Laboratories at Fort Detrick succeeding Dr. John L. Schwab, who was recently appointed Deputy for Scientific Activities of the Army Chemical Corps Research and Development Command.

Dr. Housewright, 42, formerly the Chief of the Medical Bacteriology Division at Fort Detrick, has a BS degree from North Texas State College, Denton, Tex., an MS from the University of Texas, and a Ph.D. from the University of Chicago. He served in the Navy as a commissioned officer during 1946.

Dr. Housewright participated in the early work on sulfa drugs and many of the latest antibiotics. More recently, he has been working on the biochemistry of infectious diseases. He has written more than 30 scientific papers and holds two patents which were assigned to the United States government.

AWARD OF THIRTY YEAR PINS

U.S. Army Photo

Twenty-one employees of Army Chmical Center, Md., received their "thirty year" pins at a ceremony presided over by Brigadier General Marshall Stubbs, Post Commander. Their combined years of service represent 630 years experience. In the picture above, First row, left to right: Clara V. Russell, Henry C. Newman (civilian personnel representative), Nina S. McComas, Brig. Gen. Marshall Stubbs, Catherine E. Gildea, Colonel Walter L. Maclachlan (Deputy Post Commander). Second row, left to right: Hiley F. Konntz, Cecil S. Hill, John F. Schramek, Juan R. Melendez, Carl U. Smith, Charles P. Cook. Third row, left to right: James E. Thomas, Glenn A. Little, Kistler C. Creel, Marion G. Price, John Scanlan, Ellwood McCullough. Fourth row, left to right: Victor Emanuel, Eugene P. Smith, Ross R. Butler, Earl F. Lantz, Robert A. Price, Walter J. Coburn.